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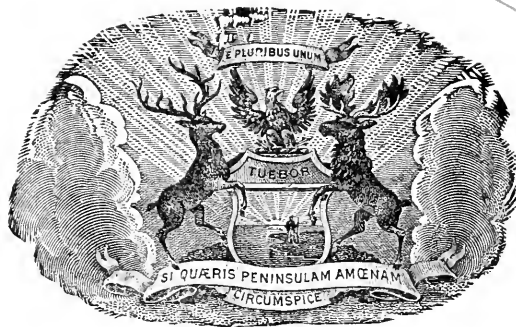
PROF. L. H. BAILEY.

TWENTY-THIRD ANNUAL REPORT  
OF THE  
SECRETARY  
OF THE  
STATE HORTICULTURAL SOCIETY  
OF  
MICHIGAN

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1893

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# REPORT OF THE SECRETARY

OF THE

## MICHIGAN STATE HORTICULTURAL SOCIETY.

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ALLEGAN, MICHIGAN, }  
December 31, 1893. }

TO HON. JOHN T. RICH, *Governor of the State of Michigan:*

I have the honor to submit herewith, in compliance with legal requirement, the accompanying report of 1893, with supplementary papers.

Respectfully yours,

EDWY C. REID,  
*Secretary of the Michigan State Horticultural Society.*



# OFFICERS

OF THE

## STATE HORTICULTURAL SOCIETY FOR 1894.

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PRESIDENT—ROLAND MORRILL, Benton Harbor.  
 VICE-PRESIDENT—C. J. MONROE, South Haven.  
 SECRETARY—EDWY C. REID, Allegan.  
 TREASURER—EVART H. SCOTT, Ann Arbor.  
 LIBRARIAN—ROBERT L. HEWITT, Lansing.

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### EXECUTIVE BOARD.

C. J. MONROE, South Haven, 1 year. T. T. LYON,               “       “       1   “ L. D. WATKINS, Manchester, 2   “		L. R. TAFT, Agricultural College, 2 years. CHAS. W. GARFIELD, G'd R'ds, 3   “ F. J. RUSSELL, Hart,                   3   “
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### STANDING COMMITTEES.

ON FRUIT CATALOGUE—L. R. TAFT, Agricultural College, Chairman; T. T. LYON, South Haven; A. A. CROZIER, Ann Arbor; D. G. EDMISTON, Adrian; W. A. SMITH, Benton Harbor; C. A. SESSIONS, Grand Rapids.

ON NEW FRUITS—T. T. LYON, Chairman; C. A. SESSIONS, Grand Rapids; S. R. FULLER, Eaton Rapids; C. ENGEL, Paw Paw.

ON FINANCE—C. J. MONROE, L. D. WATKINS, C. W. GARFIELD.

ON ENTOMOLOGY—ALBERT J. COOK, Chairman.

ON VEGETABLE PHYSIOLOGY—L. R. TAFT, Chairman.

ON LANDSCAPE GARDENING—JAMES SATTERLEE, Chairman.

ON VEGETABLE GARDEN—W. W. TRACY, Chairman.

ON FORESTRY—C. W. GARFIELD, Chairman, Grand Radids; L. R. TAFT, Agricultural College; C. A. SESSIONS, Grand Rapids.



# CONSTITUTION

## OF THE

# MICHIGAN STATE HORTICULTURAL SOCIETY.

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### ARTICLE I.—NAME, TERRITORY AND OBJECTS.

The name of the society shall be the Michigan State Horticultural society, and its territory shall be the state of Michigan. Its objects shall be the development of an adequate appreciation of the peculiar adaptation of the soils and climate of the state to the pursuit of horticulture in all its branches; and the collection and dissemination of information bearing upon the theory and practice of the same, as well as upon the arts and sciences directly or indirectly associated therewith, or calculated to elevate or improve the practice thereof.

### ARTICLE II.—OFFICERS AND MODE OF ELECTION.

The officers of the society shall be a president, a secretary, and a treasurer, together with an executive board of six members, aside from the president, secretary, and treasurer, who shall be *ex officio* members of the said board.

Said board shall designate one of its members as vice-president. The officers shall be elected by ballot.

### ARTICLE III.—A QUORUM.

Four members of the executive board shall constitute a quorum for the transaction of business at any meeting of said board: *Provided*, That each of the members thereof shall have been notified, in the usual manner, of the time, place, and object of such meeting.

### ARTICLE IV.—ANNUAL MEETING AND ELECTION OF OFFICERS.

The annual meeting of the society, for the election of officers specified in Article II, shall occur during the time between December 25 and 31 of each year, according to call of president and secretary, and the election shall be held during the second session of such meeting

## ARTICLE V.—TERMS OF OFFICE.

The officers specified in Article II shall hold their offices until the thirty-first day of December of the year for which they were elected, and thereafter until their successors shall have been elected, and shall have signified to the secretary their acceptance: *Provided*, That the terms of office of the six members of the executive board shall be so arranged that but two regular vacancies shall occur in each year.

## ARTICLE VI.—ANNUAL AND LIFE MEMBERS.

Any person may become a member of the society for one year by paying to the treasurer the sum of one dollar; and the yearly term of all annual memberships shall expire on the thirty-first day of December of the year for which they were taken, but be regarded as continuous, except as may be provided by the by-laws. Any person may become a life member by the payment at any one time of the sum of ten dollars into the treasury of the society.

## ARTICLE VII.—AMOUNT OR LIMIT OF PROPERTY.

The society may hold real and personal estate to an amount not exceeding twenty thousand dollars.

## ARTICLE VIII.—BY-LAWS.

By-laws for the government of the society shall be framed, and when needful, amended by the executive board; but changes therefor may be at any time proposed by the society in general meeting.

## ARTICLE IX.—AMENDMENTS.

This constitution may be amended at any regular meeting of the society by a vote, by ballot, of two thirds of all the members present and voting: *Provided*, That notice of such proposed amendment, specifying its purport, shall have been given at the last previous regular meeting.

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## BY-LAWS OF THE MICHIGAN STATE HORTICULTURAL SOCIETY.

## I.—THE PRESIDENT.

1st. The president shall be the executive officer of the society, and of the executive board; and it shall be his duty to see that the rules and regulations of the society, and of the executive board, are duly enforced and obeyed.

2d. He may, in his discretion, and in the lack of needful rules, during

the recesses of the society and of the board, prescribe rules for the management of the interests or business of the society, such rules to continue in force till the next session of the executive board, and until, by its action, they shall have become no longer necessary.

3d. He shall act in conjunction with the secretary in the preparation of programmes, or orders of business, for the sessions of the society; and in the devising of plans and processes for the maintenance of its interests.

4th. He shall have the best interests of the society at heart, and shall lead in forwarding any and all enterprises calculated to add to its permanency or to increase its usefulness, and establish it more firmly in the public confidence.

## II.—VICE-PRESIDENT.

The vice-president shall perform the duties of the president in case of the absence or inability of that officer; and may be called upon by the president to assume the duties of the chair at any meeting of the society or executive board.

## III.—THE SECRETARY.

1st. The secretary shall be the recording, corresponding, and accounting officer of the society, and he shall also be, jointly with the business committee, its financial and auditing officer.

2d. He shall incur no expenditure of a large or doubtful character, except with the sanction of the executive board or of the business committee.

3d. He shall submit all bills or claims against the society to the business committee for approval, and indorsement to that effect, before drawing his order upon the treasurer for the payment of the same.

4th. He shall attend all meetings of the society, and of the executive board, and shall keep a faithful record of their proceedings.

5th. He shall sign all certificates of membership, and all diplomas and certificates of merit awarded by the society.

6th. He shall have charge of the society's books and papers, excepting only such as, by the advice or direction of the executive board, shall be placed in charge of the librarian, and he shall be responsible to the board for the safe keeping of the property placed in his charge.

7th. He shall be the custodian of the seal of the society, and shall have authority to affix the same to documents when needful.

8th. He shall seek by all suitable means to secure the fullest announcement of the meetings of the society in this state, as well as in adjacent states, when such shall be found desirable.

9th. He shall, so far as practicable, cause the transactions of the society, together with such valuable or interesting papers as shall be read at its sessions, to be properly published, and thus placed within reach of the state.

10th. It shall also be his duty, yearly, to prepare for publication the annual report of the society, together with such other matter as he shall deem proper—he being aided in the selection of such matter by an advisory committee of the executive board.

## IV.—THE TREASURER.

1st. All the funds of the society shall be paid into the hands of the treasurer.

2d. He shall disburse the moneys of the society that shall come into his hands only upon the order of the secretary, countersigned by the president.

3d. He shall keep the moneys received by the society for life memberships as a distinct fund, and shall invest the same under the advice and direction of the executive board, applying only the interest accruing thereon to the purposes of the general fund.

4th. Immediately upon assuming his office, and before entering upon its duties, he shall execute to the society an official bond with sufficient sureties, conditioned for the safe keeping and disbursement of the moneys of the society, and for the proper discharge of the further duties of his office, in such sum as shall be specified by the executive board. Such bond shall receive the approval of the president and shall be deposited with the secretary.

5th. He shall, at the close of each year, report to the executive board the amount of money that shall have come into his hands during the year, the sources from which it has been derived, and the disposition made of the same.

## V.—THE LIBRARIAN.

1st. The librarian shall have the custody of the library of the society. He shall be appointed by the executive board, and may be displaced at its pleasure.

2d. He shall act jointly with the secretary in the care and arrangement of the same, and in the reception, custody, and disposal of the volumes of the transactions annually supplied to the society by the state.

3d. He shall have the custody of the rooms assigned to the society at the state capitol, together with such books and other property as the society or the board shall direct to be deposited therein.

4th. He shall report annually, at the close of the year, to the executive board the amount and condition of the property in his hands.

## VI.—THE EXECUTIVE BOARD.

1st. The executive board shall enact all rules and regulations for the management of the affairs of the society, determine the salaries of its officers, and assume the control and management of its exhibitions.

2d. It shall have power to displace any officer of the society for neglect of duty or abuse of position, and to fill all vacancies by appointment, to continue till the next annual election.

3d. The board shall hold four regular sessions during the year, to occur at the times and places for the regular meetings of the society.

4th. Other meetings may be called by the secretary under the advice or direction of the president, or of a majority of its members, at such times and places as may be deemed most convenient; but in all such cases each member must be notified of the time, place, and object of such meeting.

5th. It shall be the duty of the board to carefully guard the general

interests of the society, to watch over its finances, and to provide for its necessities as they shall arise.

6th. All important measures shall be submitted to this board, but they may by the board be resubmitted to the society with recommendations.

7th. The board shall, at the annual meeting, submit through the secretary, in connection with the reports of officers, such further report upon the condition, interests, and prospects of the society as it shall judge necessary or expedient.

8th. Two members of the executive board are to be elected each year, to hold the office for three years, but if any such member shall absent himself from two or more consecutive meetings of the society and of the board without reason satisfactory to the board, the said board may, in its discretion, consider the office vacant, and proceed to fill such vacancy by appointment, to continue to the next annual election.

#### VII.—THE BUSINESS COMMITTEE.

1st. It shall be the duty of the executive board, annually, upon entering upon the duties of the new year, to appoint from their own number three members who shall constitute a business committee for the year.

2d. All accounts or claims against the society, when presented to the secretary for payment, shall, before payment, receive the sanction and indorsement of the business committee.

3d. Such claims shall be submitted to this committee and approved in duplicate; one copy to remain with the secretary as his warrant for the payment of the same, and the other to be transmitted by him to the president, along with his order upon the treasurer, as his warrant for countersigning the same.

4th. It shall be the duty of the business committee, upon application of the secretary, during the recess of the executive board, to advise with him as to the expediency of making any contemplated but questionable expenditure for which occasion may arise during such recess.

#### VIII.—STANDING COMMITTEES.

1st. There shall be a standing committee on revision of the catalogue, to be composed of one member from each of the five districts into which the state is, for this purpose, divided, with one member chosen from the state at large, who shall be the chairman of the committee.

2d. Each member of said committee (except the chairman) is empowered and expected to choose a sub-committee for his district, of which he shall be chairman.

3d. It shall be the duty of each sub-committee to collect and report, each year, to the general chairman, such facts respecting fruit culture in the district as shall promise to be of value in the revision of the catalogue.

4th. There shall be a standing committee on new fruits, to consist of a chairman, with as many associates as such chairman shall find it desirable to appoint.

5th. Such other standing committees may from time to time be appointed by the executive board as, in its discretion, it shall deem desirable or necessary.

6th. All standing committees are expected to report at the annual meeting in December, any information of value to the society or its members

that may have come to their knowledge during the year, as well as any scientific theories, deductions, or facts that, in their opinion, may be useful in advancing the objects for which the society is laboring.

#### IX.—LIFE MEMBERSHIP FUND.

1st. All moneys coming into the treasury of the society in payment for life memberships shall constitute a perpetual fund, to be known as the life membership fund.

2d. The principal of this fund shall be invested by the treasurer under the advice and direction of the executive board.

3d. All interest accruing upon any portion of said fund shall constitute and become part of the fund of the society devoted to the payment of its ordinary expenses.

#### X.—MEETINGS OF THE SOCIETY..

1st. The society shall hold its first regular meeting for the year during the month of January or February for the inauguration of the officers chosen at the annual meeting held the previous December, as provided in article IV of the constitution, and also to arrange its plan of operations for the year.

2d. Its second regular meeting shall be held in the month of June at such date as shall best accommodate an exhibit of the early summer fruits.

3d. Its third regular meeting shall be at its annual exhibit of autumn and winter fruits, in the month of September or October.

4th. Its fourth regular meeting shall occur in connection with its annual election of officers, in December, as provided in article IV of the constitution.

5th. The times and places for the occurrence of these regular meetings (excepting only the *time* of the annual meeting), shall be determined by the executive board.

6th. Other meetings may be called by the secretary, under the advice or direction of the members of the executive board, at times and places by them deemed expedient.

7th. In case of the calling of a special meeting for the election of officers of the society, in consequence of any failure to elect at the annual meeting, as provided in section IV of the constitution, all persons entitled as members to vote at such annual meeting shall be considered as retaining such membership for such purpose until such election, and until such officers so elected shall have been inducted into office.

#### XI.—RULES FOR DISCUSSIONS, ETC.

1st. The deliberations and discussions of the society shall be conducted in accordance with ordinary parliamentary usages.

#### XI.—AUXILIARY SOCIETIES.

1st. The society shall, in all reasonable and proper ways, encourage the formation of local horticultural or pomological societies auxiliary to this society in all such counties or other municipalities of this state as shall

afford a reasonable prospect that they will be able effectually to maintain the same.

2d. It shall be the policy of this society in supervising the organization of such local auxiliaries to secure an identity of constitutional provisions throughout, and in so doing to insure harmony among them; but at the same time it will not discourage the including by them of special or local objects in cases in which such shall be found desirable, so long as the introduction of the requisite provisions therefor into the constitution and by-laws of the auxiliary society shall not be deemed likely to interfere with the harmonious workings of the whole.

3d. Any person may become a full member of an auxiliary society, for one year, by paying into its treasury the sum of one dollar; and a compliance with the provisions of clause fifth of these by-laws shall constitute him also a member of this society for the same term.

4th. The wife, and the resident single or unmarried daughters, of any full member, may also become members of such auxiliary society upon the payment of fifty cents each: *Provided*, That in such case such entire family shall become entitled to a single copy, only, of the current volume of the transactions of this society.

5th. On receipt of the names of such members, with the required fees, the secretary shall immediately transmit their names and postoffice addresses, together with half the membership fee of each, to the secretary of this society, who shall record the same and pay the money into the treasury for the benefit of the general fund.

6th. It shall be the duty of the secretary, on receipt of such remittance, with list of members, to supply such auxiliary society with a certificate of membership in this society for one year, together with a copy of the current volume of transactions for each full member so remitted for.

7th. The proceedings of such auxiliary society shall, at the close of the year, be forwarded, in succinct form, to the secretary of this society, to be by him incorporated into the annual volume of transactions, accompanied by a list of its members for the year.

8th. The auxiliary societies shall, so far as practicable, be made the medium for the distribution of the annual volumes of the transactions of the society, the nuclei for its meetings, and the means of creating interest therein, as well as the means of collecting such facts or other information or material as shall, from time to time, become needful or desirable in the conducting of its various operations.

### XIII.—AMENDMENTS, ADDITIONS, SUSPENSIONS.

1st. Amendments or additions to these by-laws may be made by a majority vote of the executive board, at any meeting; but if objections shall be made the same shall "lie upon the table" till the next regular meeting of the board.

2d. These by-laws, or any one or more of them, may be suspended for the time, by order of a majority of all the members of the society present and voting.

3d. A proposition in the general meeting of the society for an amendment or addition to these by-laws shall be referred to the executive board for consideration and decision; but the society may submit therewith its advice or request.

4th. All amendments of the constitution and by-laws of auxiliary societies shall, before they shall take effect, be submitted to the executive board of this society, by whom their approval or rejection shall be considered upon the principle provided in section XII, clause 2, and the determination of said executive board shall be final and binding upon the auxiliary society.

# PROCEEDINGS OF THE WINTER MEETING.

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HELD AT BENTON HARBOR, FEBRUARY 28, MARCH 1 AND 2, 1893.

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Opening the winter meeting of the Michigan State Horticultural society, at Benton Harbor, the evening of February 28, President LYON called Mr. C. J. MONROE, the society's vice-president, to the chair.

Prayer was offered by the Rev. GEORGE SAWLIN.

Following this was a song by a quartet of gentlemen, R. A. and D. KNEELAND, F. A. HOBBS, and J. W. MCEACHLEN, who at several other times during the sessions placed the pomologists under obligation in this way, a kindness which was highly appreciated and greeted always with merited applause.

A striking feature of the session was the address of welcome by Master WILLIE TEETZEL, "the boy orator." He is an orator by birth, certainly, for, though only seven years old, his recitations are remarkable for genuine eloquence and grace. Chairman MONROE made suitable response, and after another good song, the meeting was ready for the business of the occasion.

## PRESENT STATUS OF HORTICULTURE IN BERRIEN COUNTY

was the first topic, to which the first response was made by Mr. W. A. BROWN of Stevensville, who said: There was a time, we old people remember, when this was known as the St. Joseph peach region. The peaches went, unfortunately, but other sorts of fruit, and other forms of horticulture, were introduced, until now there is no other point in the country making so large sales of such products. It took some time for

recovery, but we now grow small fruit by the boatload, ten to twenty car-loads to the boatload, but the owners of the boats will not tell how much they do carry. Nor is the acreage of all sorts known, but we have certainly 10,000 acres of strawberries, and probably an equal area of raspberries and blackberries, besides great quantities of other fruits. During the last few years, Berrien has set great quantities of peach trees, till we have as many as any other county, though not so many in bearing. The last decade was more favorable to fruit trees and plants, as a rule, than the preceding two decades, being of milder weather, of not so severe winters. The fruit area of the county has greatly increased during the last three or four years, extending back to Niles and south to New Buffalo, but we have as yet no reliable statistics of either the acreage or the total product. Last year was very disastrous to the apple crop, yet there never was a year when fruitgrowers were on the whole more prosperous.

Mr. U. B. WEBSTER: I have been here fourteen years, coming from southwestern Missouri to grow peaches, yet the first thing I did was to pull out peach trees because of yellows. But for the past three years I have had peaches, and there are in my town of Fairplain many trees that are sound and promising. The trees have come through the winter all right and no doubt will produce abundantly this season. The Messrs. PULLEN, when peaches went, turned to small fruits, and made money, and we all followed them, but now we have turned back to peaches again, and believe we shall be highly successful.

Mr. R. MORRILL: I know nothing in the way of fruit trees and plants but is in a very hopeful state for the coming season, except the apples, which scarcely can be in good order because of blight of the foliage last season. There are a few exceptions to this, such as the Spy, Hubbardston, and Oldenberg, whose leaves seem to have better withstood the fungus. Peach trees are in excellent condition; strawberries and small fruits have been under the snow, and unless we shall yet have very severe weather they will come out all right. Of peach trees, there were 300,000 in the region tributary to Benton Harbor, two years ago, and 200,000 more in the vicinity of St. Joseph; many were planted last spring and still more will be set this year.

Mr. W. H. MILLER: Fruit buds are as good as they have ever been, of all kinds in the vicinity of Berrien Springs. Many peach trees have been set in the last two years, and we have a great many pears, grapes, and apples, all of which are believed to be in good order in every way, except the apples, which suffered so severely by blight last year. But besides the kinds named by Mr. MORRILL, I find the Keswick Codlin to have resisted the blight.

MR. THOS. MARS: I am not a fruitgrower, but there is a considerable amount of fruit grown in my vicinity, principally apples, all of which are believed to be very in bad condition. Only a few varieties made any growth at all last year, and yet many blossomed again in the fall, so we have no expectation of a crop this season.

MR. MILLER: Last year the twigs and blossoms died back—the new growth at the end of the branches. By what cause can this be explained?

MR. BROWN: It was the unfavorable, cold weather. The circulation of sap stopped, and so the new growth died for lack of sustenance. Two years before, the orchards of New York suffered in the same way, yet last year they had a good crop. So will ours recover. It is a grave mistake to cut out the apple orchards, as some are doing.

MR. CLARK of Pipestone said the people of his vicinity are discouraged about getting an apple crop, but a good one this year will do much toward stopping the cutting.

MR. MORRILL: Those of our people who are not directly engaged in horticulture have little idea how greatly our prosperity depends upon it. Latterly, of course, manufacturing has come in and become a powerful aid, but before that the horticulture of the vicinity was the main source of prosperity, and still is a most important factor. Two years ago (I have no later statistics, but the sum can not have been less last year) there were one and one quarter million of dollars paid out in Benton Harbor for horticultural products, and enough more in St. Joseph to make the total two millions. Our business men should realize that horticulture is the rock upon which we have built.

MR. BROWN: Yet the pomologists of one vicinity hardly know what those of another are doing. There are here now hundreds of Germans on small farms, who do not go to our meetings. These small places are set to fruits, and presently we find their occupants well off. I greatly wish I could get the statistics of our fruit industry, but there seems no way to gather them. Certainly, however, the industry is immense, in the full meaning of the term.

President LYON presented the following paper upon

#### DETERIORATION OF MICHIGAN ORCHARDS AND FRUITS.

That there has been sad deterioration in the health and vigor of Michigan orchards, taken as a whole, as well as in the size and perfection of their fruits, would doubtless go without saying. We recall the circumstance that, when western New York was yet a comparatively new region, not having yet fully won its more recent standing as a fruitgrowing locality, the first notable general convention of the devotees of pomology was held at Buffalo, in connection with the annual state fair. A large and excellent

collection of fruits was brought together on the occasion, among which a few were from eastern Michigan orchards, then in their pristine vigor, the result of virgin soils, just redeemed from the native forest, and yet undiscovered by codlin moth, curculio, or fungus.

So large, perfect, and beautifully colored were many of these Michigan specimens, that the experts of western New York, in very many cases, failed to recognize even favorite and well-known varieties, on account of exaggerated size and brilliant color. And yet, today, after an interval of little more than forty years, these orchards have ceased to be productive of merchantable fruit, and commercial fruitgrowing, so long one of the most profitable pursuits of that region, has already been practically abandoned.

That such experience is not to be regarded as singular, but should rather be taken as a warning of the liability to similar experiences, even in our "fruit belt," recent calamitous visitations have already warned us; and even now, when just acquiring courage to repeat our earlier undertakings, there are not wanting indications that the clear field—the absence of enemies—which attended our primary operations, is not now to be looked for, but that, for the future, perpetual vigilance and prompt and resolute warfare must be relied upon if we would win success.

But it is by no means my purpose to attempt to cover so broad a field, but rather to elicit discussion by the suggestion of causes which either have led, or may in the future lead, to the dreaded results, and following with remedies.

#### THE DESTRUCTIVE CAUSES.

(1.) Man, in his greed for wealth, is too generally taking from the soil, in crops, and omitting to make necessary or adequate returns, with the inevitable result of diminished vigor of plant, with loss of size, quality, and productiveness.

(2.) Lack of proper preparation and cultivation of the soil follows, as an almost inevitable corollary, to the foregoing, rendering results even more emphatic.

(3.) The general destruction of forests greatly and very unfavorably modifies the climate; the consequently increased velocity of the wind, over naked fields, removes moisture and warmth more rapidly; with greater extremes of both heat and cold, as well as increased liability to drouth.

(4.) Not unlike human beings, insects, when deprived of their accustomed food by the destruction of the forests, as in the case of the codlin moth and curculio, accept our fruits as a substitute, and, finding them abundant and quite to their liking, multiply at an accelerated rate; while yet others, imported from abroad in some cases, finding the new conditions specially favorable, display a fecundity unheard of in their original habitat, not infrequently, as in the case of the icerza, in California, or the gipsy moth in Massachusetts, becoming terribly expensive pests.

(5.) As in the case of insects, so in that of fungi: either by transference from our diminished forest growths, by foreign importations, or merely from the increase of orchard or garden planting, the development of fungi and bacteria has become so rapid and extensive as even to threaten the profitable existence of some of our heretofore extensive pomological interests.

(6.) There is yet another, dangerous because insidious, cause of the decadence of our orchards, due to the anxiety, already spoken of, *to get out of a thing more than is in it*. I refer to the tendency, so common with a large class of commercial planters, to plant varieties of low quality, attractive only to the eye, and which are sure to be refused by purchasers when once their character comes to be understood, which practice can only have the ultimate effect, even already obvious to the thoughtful observer, to banish our staple fruits from the dessert, to be replaced in large degree by the citrus and other fruits of the south, thus both reducing the demand for our northern product and diminishing its market value.

We just now find occasion to note yet another, though indirect, result of this short-sighted and unfortunate practice, to which may fairly and in good degree, as we apprehend, be attributed the low estimate in which pomology is obviously held by our state commission, and especially by the authorities of the Columbian Exposition, as indicated by the very cavalier treatment meted out to it from both sources.

#### POSSIBILITY OF RECUPERATION.

A full and careful consideration of the subject would doubtless develop other, and perchance even more important, particulars; but, deeming these ample for present consideration, we will only add a few suggestions respecting remedies and then leave the subject.

(1 and 2.) We are thoroughly convinced of the wisdom of the old, trite aphorism, "Whatever is worth doing at all is worth doing well," which we assume to mean, in this case, a careful study of the subject, followed by thorough enrichment and cultivation of the soil, with wise and intelligent treatment generally.

(3.) In the case of exposed plantations, the natural and obvious remedy would be the planting of screens or windbreaks, and the preservation of natural ones, to which may be added the training of trees with low heads, especially in exposed locations.

(4 and 5.) Acquaint yourselves with the habits of the enemy; learn his vulnerable points, and attack him at the greatest possible advantage, with washes, sprays, knife, or other means, not forgetting to destroy all refuse by fire or otherwise. As with animals, so with trees and plants; the most vigorous are best able to resist disease. Therefore, spare no effort to maintain them in robust condition.

(6.) The remedy in this case is so obvious as scarcely to require a statement. There is no lack of varieties of satisfactory appearance, but slightly if at all lacking in productiveness, and of good, and even high, quality. Such as these, as has long been true of Rhode Island Greening and others, only require acquaintance to command remunerative prices, while the thorough trustworthiness of the grower only requires to be known upon the market to insure ready sale, at the highest rates, for all he shall be able to produce.

Mr. C. W. GARFIELD: I think Mr. LYON's paper is very suggestive, and we should elaborate his thoughts for ourselves. We, as horticulturists, are thieves and robbers in the way we conduct business, stealing by our annual crops all the fertility there is in the soil, yet returning nothing to it. We

must change all this without further delay, and restore to the exhausted soils what we have taken away, if we wish to grow more apples. It has been well demonstrated that the body of the tree is the tenderest part, and so we must make it short and strong. Plant strong stocks and put on the tops ourselves—stocks that will withstand the increasing severity of our winters. And here again we are thieves and robbers, stealing our climate and selling it to saw-mills for sake of the pennies in it.

Mr. BROWN: There are some sorts of apple that will never be of any use in Michigan, no matter what stocks they are put upon.

"What effect will loss of last year's apple crop have upon the codlin moth?" asked some one.

Mr. GARFIELD: Are there not enough thornapples along your streams to have kept up a supply? I think enough of them will survive.

Mr. MONROE advised everybody to be ready to fight the moths, and not to depend upon anything but spraying for their destruction.

As the evening was so far spent, the subject of "Needed Legislation" was postponed till morning, and the meeting adjourned till nine o'clock Wednesday morning.

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### *Wednesday Morning Session.*

At the opening of the meeting Secretary REID read a paper upon "Some Matters of Legislation," being comments upon bills pending in the Michigan legislature, and embracing drafts of bills to eradicate yellows of the peach and black-knot of the plum. These were referred to a committee (Messrs. MORRILL, SESSIONS, and GARFIELD), and were by them reported back with certain changes suggested by various persons. The amended bills were adopted as representing the sense of the Society as to what should be done in this direction by the legislature, and copies were sent to the committees on horticulture of the house. The result was the consolidation of the bills into the law elsewhere printed in this volume.

A part of Mr. REID's paper, a portion relating to means and methods for society work, is here appended:

#### OBSTACLES TO THE SOCIETY'S PROGRESS.

Another piece of legislation that concerns horticulturists is a bill introduced by Senator BARNARD, but of which our Mr. GARFIELD is the author. It appropriates \$3,000 per year for the expenses of farmers' institutes, and has been favorably reported from the committee.

Perhaps it has occurred to others as well as myself, that this measure affects the interests of this society to a considerable degree. I find it

becoming harder each year to secure papers from, and the attendance of, the best of horticulturists at our meetings. Especially is this the case with noted men of other states whom we would gladly have with us and who would do us good. They all have some reason why they can not accept my invitations. [I must make honorable exception, from this, of our esteemed Mr. WILLARD of New York, who nearly always responds, and even says he is sorry he can not come oftener.]

I believe the main reason of this is the fact that these men can get more or less pay for time used in such ways, either from agricultural papers or from the managers of these institutes. I think that already they are paid at least their expenses in this state, and I am of opinion that Mr. GARFIELD'S bill is in part at least to provide for better pay for them in the same sort of service. At least, it would be entirely proper to use part of the fund in that way, and doubtless Mr. GARFIELD has found in his institute work the same difficulty, in some degree, of which I speak—he can not get the best of service without paying for it.

I make no objection to the passage of this bill—on the contrary, am favorable to its enactment—but use it as a text for these remarks about the condition that confronts your secretary every time he sets about the preparation of a programme.

It is far from pleasant to me to occasionally hear it said, “I do wish we could have one more such meeting as we used to hold.” I feel that it reflects upon the earnestness of my efforts to secure such meetings, though perhaps it is never so intended by the speaker. Our meetings are certainly as well advertised as they were ten years ago, and are as well attended as those I first knew of. But it must be conceded, I think, that there is not the ardent interest in them that was felt in the society's early days. It is largely so, too, in many of the local societies. The novelty of the fruit-growing business in our state has worn off, and in the place of the enthusiastic men who founded this society, and disclosed to the world the capabilities of Michigan as a horticultural region, has risen a generation of fruitgrowers who know nothing—who care for nothing—but the dollars that may be had from a crop of peaches or other fruits; who investigate nothing and so have nothing to impart to others; who see no more in their calling than the average farmer sees in his corn crop and his pig-pen.

“It is the same old story, at these meetings,” I sometimes hear them say, “and the men who talk most are the ones who cultivate least and grow the poorest fruit.” The severity of this commentary lies in its measurable truthfulness, at least in some localities I wot of. So lagging is the interest in some places, in society work, that in one place, to induce attendance of those who would be benefited most, the society president offered to give a premium of strawberry plants to all who came at a certain time. The attendance at that meeting was marvelous, and the indiscreet but generous and enthusiastic president had less strawberry plants but more wisdom as a result of his effort to better his fellows. It somehow seems to me that something of this kind occurred near Benton Harbor.

I am very well aware that one half the world has to carry the other half, and I do not expect to immediately reverse the order so long established; but only to remind you of these conditions that make the harder our efforts to keep up the work of these societies.

That work is to be made yet a little harder by the enactment of Mr. GARFIELD'S bill. No one can blame Mr. A. or Mr. B. for preferring to take pay for a paper or a lecture at an institute rather than to do the same work

for nothing at a meeting of this society. Wherever one of these institutes occur in a fruitgrowing region, most or all of the programme is devoted to horticultural interests. This takes the place to that extent of the work of this society. The state of Michigan, with her plethoric treasury, is becoming a competitor of ours, and in such an uneven contest we shall with difficulty hold our own.

If, when applying to some horticulturist of high standing, for a paper or lecture before this society, I could say, "your expenses will be paid," or "your expenses and \$25 will be given for this service," as may now be done by the institute managers, the results would be very different, I assure you, from the polite declinations which I all too often receive.

So, if hereafter you look over the programmes and miss the great names that erstwhile adorned them, I beg of you, call to mind this little tale of the frank and furious west: In a certain frontier mining camp, up back of the solitary and execrable musician, was posted this legend: "Don't shoot the fiddler; he's doing the best he can."

Proceeding from consideration of matters of legislation, the society listened to the following suggestions by President LYON, concerning a possible exhibit of fruits of 1893, by the societies of Michigan at the Columbian exposition:

FOR A SOCIETY EXHIBIT OF FRUITS, ETC., AT THE COLUMBIAN EXPOSITION.

1. Articles to be donated and prepared for transportation free of charge.

2. The transportation, reception, placing and after care of the exhibit, to be paid from the fund heretofore set apart for such purpose, by the state commissioners, together with the shelving or other fixtures needful for the purpose.

3. The cards or labels should contain the name and address of the contributors, together with that of the local society, the name of the parent society only appearing upon a general sign.

4. Each local or auxiliary society should select a committee of efficient persons, charged with the work of effecting, in advance, special engagements for the fruits needful to fill an agreed space, and for the renewal of the same as shall be necessary.

5. No entry for award shall be made by the State Horticultural society, such entries being made by the local societies or by individuals only.

6. The local society receiving the greatest number of awards (or such as shall indicate the highest degree of merit, as the case may be), shall be entitled to one hundred volumes of the transactions of the state society, over and above the number due to memberships; and to each of the others, a pro rata of that number, based upon the comparative number or value of their several awards, in addition to which each shall be entitled to the society's diploma, specifying the awards received, and so far as practicable, the exhibits upon which they were severally rendered.

BUT HOW CAN ALL THIS BE DONE?

Mr. GARFIELD: Mr. LYON is chairman of the committee on horticulture, appointed by the state commission; and if the money is in his hands

with which to make an exhibit, I move we adopt his suggestions; but we have never had any assurance that we (the committee) had any control of a dollar of it. We have been told to go home and raise the money ourselves, the \$4,000 nominally appropriated for our use being only for costs of transportation. For information of those unacquainted with the state of affairs, Mr. GARFIELD rehearsed the facts brought out at the Ann Arbor meeting, and continued: There is no courtesy we would not do our president, and if he can tell us how we may carry out his suggestions, we are ready to adopt them.

Mr. LYON: A committee might be appointed to go to the commission and ask that they turn over to the society the \$4,000, or such portion of it as may be, to help accomplish the object.

Mr. WATKINS: We must be careful of our reputation, which is high, and not go to Chicago in competition with states which are backed by plenty of money. We would better stay away and repose upon our reputation won on former occasions.

Mr. KELLOGG favored letting the matter entirely alone, and leaving the responsibility for the failure upon the commission, which certainly has shown not the least capacity to deal with the matter. He moved that, in view of the indifference of the commission, and of the late date, we decline to further consider the question.

Mr. MONROE thought it better to hold it in abeyance, for, being at the very door of the exposition, we must surely make an exhibit.

Mr. MORRILL: It must be understood that this statement of Mr. LYON comes from him as chairman of the committee, not as president of this society.

Mr. MONROE: The state society applied for the exhibition space. It was granted, but when I went there recently I found so many conditions to be fulfilled that I dared not accept it for the society, and so insisted upon Mr. STEVENS doing it, in behalf of the commission. We applied for 5,000 feet of space. There were many other applicants, and so it eventuated that only 499 feet were given us, within which were two tables only. New York, adjoining us, was given only the same amount. We are in good company—New York, California, Illinois, Wisconsin, and Missouri—but it is company that has plenty of money, and so we are at a serious disadvantage. Other states are preparing elaborately, spending in some cases, so much as \$3,000 for designs and constructions for the exhibits. By the first of September, 2,500 feet more will be assignable to Michigan. There is enough of the canned, wax, and cold-storage fruit to fill the tables. If we may have money, we can make a good showing of next season's fruit, after Sept. 1. If the state grants the proposed extra \$50,000, we

may obtain some of it; but if not, we must take up one of the bills for an appropriation to the society, and urge its passage.

The whole subject was referred to the executive board, to be reported upon at this meeting, and adjournment was made till afternoon.

IT WAS HARD TO ABANDON HOPE.

Upon reassembling, Mr. MONROE presented the following resolution from the executive board, and on motion of Mr. KELLOGG it was adopted:

*Resolved*, That, in view of the fact that this society has taken no active part in preparing an exhibit for the World's Columbian exposition, it refrain from taking any action until such time as the present bill, proposing an additional appropriation, shall pass or fail. If it pass, granting a fair share to horticulture, then, as individuals, to continue to do all we can in assisting the committee appointed by the state commission in making said exhibit as planned by said commission. If said appropriation fail, thereby depriving the horticulturists of sufficient means to make a creditable display, then it is the sense of this meeting that a bill be passed granting an appropriation to make an exhibit of horticultural products at said exposition by this society.

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*Wednesday Afternoon Session.*

Two papers upon peach culture had been promised for the meeting, but, for some unexplained reason, only one was forthcoming, Mr. J. F. TAYLOR failing to either attend or report. The following paper was read by the secretary, having been written by Mr. J. N. STEARNS of Kalamazoo:

VARIETIES OF PEACH TO PLANT FOR PROFIT.

I am aware this is a topic upon which no two will agree. Therefore, what I shall have to say upon the subject will be my own conclusions, arrived at from twenty-five years' experience in peach-growing; and if by these few words I prevent some from making some of the mistakes I have made, the object of these lines will be accomplished.

Hardly a week passes in which I do not get a letter of inquiry as to what are profitable varieties to plant. In many cases there will be enclosed a list of which the writer thought favorably, and I am asked what I would strike out and what add.

In nearly all these lists, I readily discover the earmarks of the very knowing tree agent, or the wonderful descriptions of the many flaming catalogues circulated through the mails.

We may pride ourselves on our knowledge and experience, so as not to be caught by these beautiful fruits on paper, but we all have to admit they have their influence on us. One of these that caught me was the Wheatland. It is a beautiful peach, and I have been trying to grow it ten years, and if I had had ten acres of the sort for that length of time I would not have had ten bushels of peaches. The Foster has been nearly as bad a failure with me. Crawford's Early has been of no profit to me. Crawford's

Late is some better, but I would plant but few of these for profit, unless in unusually favorable localities for the peach.

There are several other popular and standard sorts that I am fruiting quite largely, that I would not plant again. Among these are Hill's Chili, Jacques' Rareripe, Mountain Rose, Oldmixon, Alexander, etc., etc. These, except the latter, are good peaches under favorable circumstances, but for profit they have too many faults.

To illustrate, we will take the old standard sort, Jacques' Rareripe, sometimes a beautiful peach, on young trees especially; but, as a rule, if we bring in, say, five bushels, we may get two bushels of first-class peaches, two of seconds, and one of worthless culls.

Now, this is too many poor peaches. The same fault is true of Crawford's Early, together with the fault of its being tender in the tree.

In planting 900 trees for market, I would select about the following list, named in their order of ripening: 25 Hale's, 100 Lewis, 300 Kalamazoo, 300 Golden Drop, 100 Smock, 75 Salway.

It will be observed that in this list I include no white peaches ripening after the first yellow peach.

Out of hundreds of orders for peaches the past season, only one order was for white peaches.

The above list has the merit of being hardy, regular bearers, and the fruit, although not of the largest, is of good size and uniform, producing but very few cull peaches. It also covers nearly the entire season.

I will give one comparative illustration. I have an eight-year-old orchard, in which I have some twenty varieties. There are fifty trees in a row. The lay of the land and the soil are uniform as nearly as possible. I have the following varieties, side by side: Kalamazoo, Jacques, Golden Drop, and Hill's Chili. There never has been a year of peaches that either one of the rows of Kalamazoo or of Golden Drop was not worth much more than both rows of Jacques and Hill's Chili combined.

Of course, every one should plant a few of the finer qualities of peach, for table use, like Mountain Rose, Crawford's Early, George Fourth, etc.

President LYON: Most growers of the peach, very properly, plant for money; but others should not plant in the same way for home use, but set the better varieties instead. The same is true of all other fruits. The better sorts are likely to be delicate in constitution. They should not be planted with the idea of profit, but because one wishes to get something fit to eat. It is all right to plant for commercial purposes, but even this may be overdone, and varieties set which are too poor for even what are called "market purposes."

Mr. KNOWLAND: What is the Kalamazoo peach?

Mr. MORRILL: I have fruited it twice. It is a large yellow peach, with bright red flush, ripening with Late Crawford; it is uniform in size and from medium to large, of regular shape and good quality, the best of its season. It has so far been hardy. I do not think it is a "long shipper," but it meets Mr. LYON's idea of a market fruit. The original tree stood in the back yard of Mr. STEARNS' house in Kalamazoo, a sprout from an old stump. Seeing its good points Mr. STEARNS propagated from it. It

sets many buds, and must be thinned to six inches apart. I would set it largely this year if I had the trees. Next year I shall set fifteen acres with Lewis, Elberta, and Gold Drop, but I like the Kalamazoo as well as either—it is a richer peach.

Mr. H. J. KINGSLEY of Fennville, replying to a question, said that about Fennville, say a mile or a mile and a half distant to the west, yellows has exterminated the peach trees, but further on they are still in good condition. He said he would not top-bud peach trees.

Stevens' Late Rareripec was recommended, being later than Late Crawford. Chair's Choice resembles Early Crawford, but is hardier. There are some localities about Benton Harbor where neither of the Crawfords do well.

Mr. WATKINS: About Ann Arbor the varieties cultivated are practically the same as here. They are setting many orchards there, where the air drainage is sufficient, and the peach seems to stand a greater degree of cold in the eastern part of the state than in the west, doubtless because the air is drier; but Hale's is not successful.

Mr. KELLOGG: I am not a peach-grower, nor are many peaches grown about Ionia. One man has about 1,800 trees, mostly Early Crawfords, with some Chilis, the latter being the more profitable. Nor are many setting peach trees about Ionia, but in the township of Boston the plantings are considerable.

Mr. POST: It is only within recent years that a special interest has been felt in peach culture at Lowell, but now it is a considerable industry, and in the adjoining township also. More of the Early Michigan are set than of any other variety, the Chili standing next. There are 100,000 trees within a circuit of ten miles about Lowell.

Mr. KNOWLAND: Twenty-five years ago, I grew some Smocks, but I notice that the Smocks now grown are a different sort of peach, being larger. Are there different kinds of Smock?

Mr. MORRILL: It may be that what we now have is the Beers Smock, which is a better sort than the old one, and a trifle later, perhaps. It has a brighter color and is larger.

Mr. KNOWLAND: The Smocks were the most profitable of all my peaches last year.

Mr. W. K. MUNSON said that 400,000 bushels of peaches were marketed in Grand Rapids, last season. Perhaps fifty varieties are grown, from Alexander on through the season. Many are planting new peach orchards, and they are setting many varieties.

## UNJUST FREIGHT CLASSIFICATION.

Mr. MUNSON proceeded to speak at length about the unjust classification of peaches in Climax baskets, made by the railway companies. They are rated at one and one half first class. This rate was established in the days when the peach basket was big at the top, little at the bottom, round, and difficult to pile up and make stay up. Such baskets, when in crates, were, and crates still are, carried for one first class rate. As a matter of fact, however, the present style of basket is a better package to pile and handle, than are crates, and they should be carried as cheaply. The Grand Rapids growers are trying to get this wrong made right, and to that end ask the support of this society. Mr. MUNSON introduced the following resolution, which was adopted:

*Resolved*, As the sense of the Michigan State Horticultural society, that the classification of freight which now places peaches at one and one half of first class rates, is a great injustice to peach-growers, and that we hereby request the authority which makes and changes classification of railroad freights, to so modify the present classification as to place peaches in baskets, or other packages, in same category with grapes, plums, pears, and other fruits of this class at one rate.

Mr. MUNSON also said the pomologists about Grand Rapids are setting grapes largely.

Mr. BROWN: The question seems to have been disposed of, and the action taken is entirely proper, but it is a matter that does not concern us of the lake shore, particularly. We have by water cheap and very satisfactory transportation. Our fruit reaches the market early and in as perfect order as it is possible to have fruit carried.

Mr. BRIDGEMAN: I must differ with Mr. BROWN. The question concerns each of us in some degree, for the Chicago & West Michigan railway probably charges these rates from some places in Berrien county as well as elsewhere.

## MORE ABOUT VARIETIES OF THE PEACH.

Mr. SESSIONS: We have been planting peaches for market purposes in Oceana county, for twenty years. The majority of us prefer Hale's as a market variety. We know it is of poor quality, but its season with us, coming when there are few peaches ripe to the south of us, makes it desirable. Waterloo is planted for earlier. Planting of Lewis and Rivers is increasing, while the Crawford's are not set to a great degree. The Conklin is becoming popular. It is a large, yellow peach, about like the Crawford. Barnard is liked for its hardiness and shipping qualities. We are setting no white peaches which ripen after the first yellow variety. The Kalamazoo and Gold Drop are replacing the Chili, Smock is liked,

and it ripens with us at least two years out of three, and then is profitable. I have both the Foster and Crawford but can not tell the difference.

MR. KNISLEY: Will Mr. SESSIONS please define the difference between Waterloo and Alexander?

MR. SESSIONS: There is a little difference in the appearance of these two varieties, and in the manner of bearing. Waterloo is smaller than Alexander, of darker color, more solid; but the difference in bearing is very slight.

MR. KNISLEY: It is bad policy to have so many varieties so nearly alike. I have mixed Waterloo and Alexander peaches together, and our best men could not detect the difference.

MR. WINCHESTER: I think we ought to pull out all those earliest varieties that are so much alike, and none of them good. The new Smock differs from the old one in several respects. Speaking of white peaches, Stevens' Rareripe brought more money for me, last year, than any other sort. It is a large, hardy, white peach, equal to the Oldmixon. Rivers is profitable here, being the earliest good peach, and we having water transportation, so that it reaches market without serious injury. Amelia is too small. I have not fruited the St. Joseph, but from what I know of it believe it to be an excellent peach. It is ripe and out of the way of all other peaches of its color—yellow. Many are setting the Crawfords, about this place, because we have latterly had such mild winters that they hope for success in the same conditions in the future. I would not discard the Oldmixon, although it is not so profitable as some other varieties.

MR. BROWN: I have seen Early Michigan, Brown's Early, and Lewis, and found them to be very much alike in all essential points, yet it has been decided that they are different varieties. Lowell seems to have gone wild over the Early Michigan, and the people there are planting little else.

MR. A. S. PACKARD: The Salway is a fine peach, but the tree is tender. Its quality is high, and it is very productive. I made more money from Smock, last year, than from any other. The fruit was large, not more than four per cent. going to fourth grade, while twenty per cent. of the Barnards went there. I would plant Crawfords, but not the Susquehanna. It is said to be a light bearer, but it was the most excellent in quality of fruit of any I grew.

MR. LYON: The Foster varies but little from the Early Crawford and is but little better. Like the Crawford, its parent, it is tender in fruit bud, and there is but little difference in their fruitfulness.

MR. MORRILL, asked as to use of commercial fertilizers, on peaches, said he had used only bone dust and ashes, on Foster and Lewis (500 pounds

of bone dust per acre, in the spring, and ashes later), that had borne heavily the year before. Where these fertilizers were used, the fruit was larger and finer, and the trees in better condition, than elsewhere. He thought the treatment a decided benefit.

#### SOME SMALL FRUIT TALK.

Mr. KELLOGG: I have forty acres in small fruits, and have a home market for my entire product. At first I sold to dealers only, when I began, ten years ago, but turned to peddling instead. I have given much care to the improvement of the quality of my plants. I began by taking exceptionally vigorous plants, putting them by themselves and keeping off all blossoms, in order to make vigorous plants for the fields. In this way, I believe I have secured better and more uniform fruit. Take the Warfield strawberry; many have been sold from weak, old stocks, and so the berry often appears in market very different from what it should be. My Warfields are so vigorous, having been set from a bed in which no fruit is allowed to grow, but only plants for setting, that they overcome the effects of frost, last spring, and bore a crop in the fall. Warfield should be fertilized with Michel's Early, every fifth row being the latter. It has abundant pollen and strong. Haverland is my next most prolific berry, and I like Parker Earle, though it requires strong soil. If your ground is frosty, set Enhance. It seems to have secondary or dormant buds, which come on and make a crop if the first are spoiled by frost. Such buds are also to be found upon the Warfield to some extent. The numbers given the Warfield at first have always been confusing. There are not two Warfields. What was called No. 1, is now the Sandoval. Beder Wood is uniform in size, holds up its size well to the close of the season, is early, and bears well. I think of using it as a fertilizer instead of Michel's. Hansel, Crimson Beauty, and Cuthbert are my preferred sorts of red raspberry, the latter being my main reliance. Johnson's Sweet, Miami, and Gregg are the kinds of black-cap I grow, but I believe Older will become a popular berry. The Bubach strawberry, on strong, rich soil, when thinned, is a grand berry. I have not tried it in the matted row.

Other growers thought Bubach does better than most sorts in matted row culture.

Inquiry was made as to Thompson's Prolific raspberry. Mr. LYON said he had it several years, but never got anything out of it worth speaking of. Mr. KELLOGG pulled his out.

As to setting strawberry plants, Mr. BRUNSON said: I merely take a spade, press the earth apart, for the plant, press the earth to the plants with the foot, and every one of them will grow.

Mr. KELLOGG said the earth is glazed by pressure of the spade, and the roots will not grow through it; but Mr. BRUNSON said he had never had any difficulty of that kind.

Mr. KELLOGG: I pass a spade along a long line, but break up the earth, avoiding that glazed surface. I carry plants in a little water kept in the bottom of a basket by manilla paper. On my soil it will not do to press the soil firmly with the foot, but only so the plant will not pull out easily. I cultivate one way only, putting the harrow right over the plants while very young, so as to keep down the weeds, letting the plants slip between the teeth. The teeth of the harrow I use are perpendicular, and I bear lightly on the three teeth over the row, but heavily upon those in the center.

Asked Mr. WEBSTER: Who has a blackberry that excels Wilson for profit?

Mr. MORRILL: I have set mainly Early Harvest, but am not sure this would be best for others. Locality and conditions of various sorts so influence varieties that it will not do to name one as being good for universal use.

Mr. WEBSTER: On Fairplains they pulled out Early Harvest, but on Mr. MORRILL'S heavier ground it seems to do well. We are somewhat troubled with an insect which bores into the blackberry canes, and they swell and break off.

Mr. WINCHESTER knew of this pest, and said he is easily exterminated. Go through the fields in the fall, cut off and burn the swelled canes, and that will be the last of them.

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### *Wednesday Evening Session.*

Having been pressed to give some account of the things interesting to horticulturists, which he saw while upon his European trip last year, Mr. C. W. Garfield proceeded thus to speak of

### FOREIGN MARKET PLACES.

We began our journey through England at London, going up the east side of the island to Edinboro and Glasgow, returning on the other side and thence going to Amsterdam, Rotterdam, and then continuing across the continent. When stopping in any town, and finding it was market day, we went to the market the first place of all. At Edinboro we found things very much as they are at home. At Carlisle we found a man selling hot potatoes, two for a penny, and working men buying them put

one in each pocket and went home. The markets in England were very full of fat stock, in the finest condition, very carefully attended and treated as though pets. Market days are set so as to alternate in neighboring towns, three days in each week. The stock are carefully led or carried to the markets, and the people are clad cleanly, the men all wearing collars, and seem to take pride in going. There is a less variety in the markets than in our own, but there is much less of inferior goods. On down to London we found the market places very much alike, being simply a widened street or at four corners. At all of them there were plenty of snap games with which to get the countrymen's money.

The great market of England, at London, is most interesting. It is held on Tuesday, Thursday, and Saturday of each week. Here there is great bustling, no courtesy, much quarreling, but no police. The market men prefer to have none, but to settle their quarrels themselves. The packages used are clumsy, largely made of willow, and all things are sold by the pound. This is the Covent Garden market—Convent, originally, having been established in 1560, when it was known as the Westminster market. The fruits, vegetables, flowers, etc., are kept in separate parts of the market, and there is not the least effort in display of the wares, or at least no taste is shown in this direction, even with the fruits and flowers. Quality only is relied upon for effecting a sale. When we returned to London in the fall, we found American apples, both from the United States and Canada, the latter greatly superior. Ours were all poorly packed. If we expect to make anything from our fruit in foreign markets, we must improve our methods very much. Kings and Baldwins sold for \$4.25 per barrel, but were retailed by the hucksters at the rate of \$12. In July all the peaches in this market were from France, except those grown in hot-houses in England, the former selling at from 12 to 35 cents per pound. While we were there some California peaches came in, and the next day the French fruit was down to 3 and 4 cents. The California fruit was ten times as good as the French, and it was in perfect condition. Grapes were attractive, but poor in quality, having been grown under glass, and were very inferior to the French Sweetwater grapes, yet they sold at a higher price. Dukes and lords grew these hot-house grapes, and were proud to be known as farmers. A grapevine at Hampton Court had on it 1,200 pounds of grapes when I was there. It was of the Black Hamburg variety. The loads carried by the wagons in these English markets were tremendous. Cabbages were piled up till they were in size like our loads of loose hay. But the roads are like floors, and these great loads were not a severe tax upon the strength of the horses. From the opening of Covent Garden market, till 9:30 o'clock, the trade is wholesale. After that the retailers take their places. But one could get single baskets of produce from the wholesalers. The bananas, oranges, and lemons offered here were nowhere nearly equal to our own. The bananas were grown in some of the eastern countries. Men carry enormous loads upon their heads, from the wholesalers' trucks to their retailers' donkey carts. The big wagons extend outside the market and down the street, side by side, half a mile or more, and one can not go till all go.

In Holland the markets are very different from these in England. The people are more cordial in their treatment of strangers and of one another, and all are courteous. In Rotterdam we found an annual market, the people bringing great loads of odds and ends, spending several days and having a good time. Citizens of the place were there in goodly numbers,

to gather in the spare money of the country folk. There were no smiles at the antics and rusticity of the rural visitors, but instead there was very sober approval of all they did. There were all sorts of catch-penny devices, and much drinking to excess as well as more moderately. The young people would go singing through the streets all the night long, yet they were not disorderly—simply out for their annual holiday and bound to enjoy every moment of it. At Delf, ten miles away, we found another such market. The cities paid all the expenses of these annual gatherings. At Amsterdam, all things were brought to the market in boats on canals. We would doubtless have stayed longer in Holland, for we found the Dutch the jolliest, most courteous people we ever met—all speak English and are ever ready to help one find his way or explain to him anything he does not understand—all are proud of an opportunity to speak to an American, and proud of the influence their people have had on America (and it is more than is supposed by unthinking people)—but Holland is one great stink. Everything is dumped into the canals, where it reeks and decays, and smells to heaven. If there is anything in the germ theory of disease, there should not be a Hollander left. Yet we found the country to be very healthy, so it is not the smell that kills us.

German markets are managed by women. The fish are kept in a tank, alive. Cheese is sold in fifty or sixty kinds, all labeled, and each plainly a variety, and each of a different smell. I was disappointed as to the fruit in Germany. There are great quantities of it everywhere, even on the roadside, and free to all to help themselves, but it is not fit to eat and is mainly used for cider. Pear trees extend for miles along the highway, but the fruit is sour and bitter. We found no good fruits in Germany nor Switzerland. The grapes are only grown for wine, and are unfit to be eaten. At a few places, where American travel has made a demand for grapes, one can get a few for fifteen to twenty cents per pound. Good apples and grapes could be grown, of course, but no attention is paid to the growing of good fruit. The people do not want fruit to eat, but only to drink.

At Waldshut, a little town near the German-Swiss border, we found a market about a quarter acre in extent, and here there were 250 bulls so nearly alike that one could scarcely be told from another. The next day there were two or three times as many. They were there to be inspected and graded, the grade fixing the price. Not one of them had a ring, and nothing but light ropes were used to confine them. They stood in long rows, face to face, perfectly docile. We found they had been brought to this state of gentleness by the process of selection in breeding. After inspection, girls and women led them off to the hotels—for hotels and barns were under the same roof. Here the country people live in the villages and go to their farms, perhaps ten miles away, which really is not far, over the roads they have there.

Paris has the greatest market of the world, and it is a rare pleasure to visit it, for it is so thoroughly classified and so beautifully arranged. Everything is labeled, both as to kind and variety, so that one may see dozens of sorts of a vegetable, each with its own name attached. Besides this care of arrangement and study of effects, the people are happy, chatty, and polite, though very urgent in soliciting patronage. Those of one part of the great market rarely or never visit other parts. So when my friend, Secretary Reynolds of the Agricultural College, bought a bunch of forced lilacs and appeared in the fish market with them still in hand, they

excited the curiosity and admiration of the women. One of these was particularly demonstrative. She with the rest had gathered around Mr. Reynolds with many expressions of delight. "Oh the pretty flower!" she said, "O the pretty flower! For me? for me?" And while chattering in this winsome way (she was very pretty) she had taken out of Mr. Reynolds' hand the finest flowers of the lot. A striking feature was the remarkable beauty of the funeral decorations offered for sale. Here, too, everything was sold by the pound. Tomatoes were 3 to 5 cents, mushrooms 6 to 10, beans 3, 5, and 7, peas 6, Fameuse apples (fine and of French production) 1 cent; grapes, not of extra quality, and it was the height of the season, 10 to 14 cents; pears 6 cents, cress 2, strawberries 24, potatoes 2, celery 1 to 2, cabbages 3 to 4, radishes 2 cents for a bunch of 35, peaches 5 cents each, eggplants 2 cents each.

In Basle the market is ten rods square, and the salesmen's spaces are marked off in squares with red paint on the floor.

In most foreign markets the consumers come directly in contact with the producers. Such things as our suburban corner groceries are unknown, and householders have to go on market days and buy supplies sufficient till the next one. At most there are but three classes, the truckers, hucksters, and consumers. It must be irksome to go so far to market, both for the buyer and seller, and our middleman system is a decided improvement.

The butter, in Europe is never salted. It is cut off in a chunk for the buyer, wrapped in paper, and laid in the basket beside the rank cheese or other contents—and the cheese is pretty sure to be there.

The proceedings were enlivened by a song and a poem, the latter by Mr. U. B. WEBSTER, an amusing recital of the experiences of pioneer days, "When I was a boy, with head like tow."

These were followed by a paper by Mr. D. G. EDMISTON of Adrian, on

#### CULTIVATION OF THE PEAR.

After having consented to write a paper on the above subject, I find myself greatly at a loss to know how to write for an audience with whom I am little acquainted, and for a locality with which I am not at all familiar. I can only write of my experience and of such observation as I have been able to make, principally in the southeast part of the state.

#### LOCATION—PREPARATION OF SOIL.

First in importance to the intending pear-grower is the selection of a suitable location and soil. The location should be elevated and well drained, either naturally or artificially, and a good strong clay soil or clay loam is to be preferred. Yet a gravelly or sandy soil with clay subsoil will often give good results.

For family use I would plant on the best soil and situation I could command, but for a market orchard, if I could not command a satisfactory soil and location, I would not plant, for I believe there is no other fruit grown in this country for which it is so essential to have just the right soil and situation as the pear, and the man who plants without these favorable conditions will usually come to grief in the end.

A thorough preparation of the land before planting is essential. The rows should be staked off twenty to twenty-four feet each way, for standard pears. I would prefer good one-year-old trees, as they transplant with less labor and less loss of growth. Most people, however, prefer a two-year tree. The roots should be well cut back and the top of the one-year tree cut back to the height at which it is desirable to have the head formed, usually three to four feet. The branches of the two-year trees should be shortened two thirds of the last year's growth. The roots should be puddled before going to the field, or stood in a tub of water, which is quite as well, and a tree at a time taken out as wanted for planting, so that the roots will not become dry in the least, and the soil will more readily adhere to the wet roots. The soil should be well pressed about the roots when planting. A little extra care in getting the trees just right in the rows will give much pleasure in after years.

#### CULTIVATION OF THE ORCHARD.

For a few years after planting, some hoed crops may be grown between the rows to good advantage, provided the fertility of the soil is kept up. The cultivation and fertilization of the soil should be continued, whether any crops are grown between the rows or not, so long as it is possible to do so by shallow plowing and frequent dragging so as to keep the surface soil fine and mellow. No small grain crops should be tolerated in a young orchard. My experience and observation lead me to the opinion that the usefulness of the orchard ceases very soon after cultivation ceases.

#### FOR MARKET OR FOR HOME USE.

We now come to the most difficult, and yet the all important, question for the grower to decide. It is presumed that most orchards are planted for one of two purposes. First, to afford a supply of choice fruit for home consumption, in which case such varieties should be selected as are pleasing to the taste, reasonably productive, and ripening at proper intervals through the season. Second, to produce fruit for the market. In other words, the orchard is to be a money-grower. Consequently the selection of varieties should be made with that end in view, and with the understanding that the orchard should last and grow better for forty or fifty years, or even longer in favorable locations, and with proper care. Then, only such varieties as are hardy, long-lived, and productive, and produce fruit of such size and quality as will be satisfactory in the markets, should be planted. This is the most perplexing question that we as growers have to contend with today, and doubtless will continue to be, because new varieties are continually being introduced and new conditions brought about, both to the grower and to the market, that are likely to render a change necessary. Many of our popular varieties are popular today only because of their former record, and not because of present good behavior.

Of the more than fifty varieties in my own orchard, each one of which was planted because of some supposed special merit, not more than a dozen varieties, perhaps, have sufficient merit to justify their continuance in an orchard for market purposes. The other varieties stand there almost as cumberers of the ground.

## FAULTS OF THE BARTLETT.

I am of opinion that if the Bartlett was introduced today it would never reach its present high standing, in this part of Michigan at least. The tree lacks hardiness and durability to an extent that would rule it out entirely were it not for the high prices at which its fruit is quoted in our city markets. The oldest pear orchard of any considerable size in Lenawee county was planted about forty-five years ago, and originally consisted principally of Bartlett and Flemish Beauty, with a few Tyson, Lawrence, and other varieties.

Twenty-two years ago, the original Bartlett trees having failed, their places were filled with the same variety. Today there is not a Bartlett tree in that orchard, while the Flemish Beauty, Tyson, and Lawrence of the original planting, are as thrifty and healthy as at any time in their lives, bearing perhaps an average of ten bushels to the tree for the last twenty years, and in favorable seasons some trees produce so high as thirty bushels. It may be said that this is an exceptional case; yet, as I look over the county, I can find many very large old trees of Tyson, Flemish Beauty, Lawrence, and a few Sheldon and Anjou; yet I can not call to mind a single tree of the Bartlett of any such size and age.

It is true the Bartletts will come to bearing earlier than any of the other varieties named, and will probably produce more fruit for the first ten or fifteen years of their lives; yet, after that time, the Bartlett will soon fail, while the other varieties will be growing better for the next half century if well cared for. This may not be so in the lake shore region, nor further south, but it certainly is here.

## DESIRABLE VARIETIES.

Then, without further discussion of the varieties, I would name the following list, each one having some of the desirable points for a market pear:

Tyson—Tree hardy, vigorous, and productive, tardy coming into bearing, fruit medium size, sells well.

Clapp's Favorite—Tree vigorous, productive, and hardy, fruit large and handsome, and sells well if not overripe; pick early.

Bartlett—Desirable only where it is known to be hardy.

Flemish Beauty—Tree hardy, vigorous, and productive, slow coming into bearing, fruit inclined to scab.

Onondaga—Tree a good stocky grower, hardy, and productive of good, large-size fruit.

Anjou—Tree hardy, medium grower, slow coming into bearing, after which it bears well of large, nice fruit and sells well.

Sheldon—Tree a good grower and hardy, not productive, fruit large and of fine quality.

Kieffer—Tree vigorous, hardy, and productive, bears early and well; fruit good to sell, not to eat.

Lawrence—Tree hardy, slow grower, slow coming into bearing; one of the finest winter pears. There are a number of other varieties that might be desirable for market purposes under favorable circumstances.

Seckel, if given high cultivation and fruit vigorously thinned, would give good results; tree hardy, slow grower.

Bosc is a magnificent pear and might be profitable top-grafted on a good, hardy variety; a good bearer.

Brignais: I have a single tree of this variety, about twelve years old, that has given better and more uniform results the last five or six years than any other tree in the orchard; fruit medium size, always smooth and perfect.

Chambers: A single tree of this new variety is giving good results here, for a large-size early pear, ripening about with the Madaline and nearly as large as Flemish Beauty. Tree thrifty and hardy and a beautiful grower.

No reference has been made to dwarf pears, and it may be said, in a general way, that the standard trees are the safest to plant as a rule. Where dwarfs are desirable, the Angouleme and Louise Bonne are the only varieties worth planting in this locality, and they should have the best of soil and cultivation.

#### EXPERIENCE OF OTHERS.

Mr. CLARK: Mr. EDMISTON advocates cultivation of the pear orchard, I notice. I have been advised to seed down the land after the trees come into bearing.

Mr. MONROE: A change of view has come about as to this, as it has concerning cultivation of other fruit, and it is now considered that the better the culture the better the fruit, so far as pears are concerned.

Mr. BROWN: Growers here would not differ much with Mr. EDMISTON, except that most of them would favor the Bartlett. They probably would plant one half of their ground to that variety. The Howell has done well here on light soil. The best pear-growers here would say, cultivate first, last, and all the time.

Mr. KNISELY: I continually hear the Kieffer called a poor pear; but it will keep till Christmas, and then certainly is good. It brings a high price, too, in its season. I practice throughout cultivation.

Mr. SHRIVER is a cultivator of his pear orchard, also, and agrees with Mr. EDMISTON as to varieties, except that he would add Clairgeau.

Mr. WHITEHEAD: In Ohio they cultivate the pear, or not, according to the fertility of the soil. On the rich soil near here I have seen blight where there was cultivation. But when cultivation is practiced I do not think it should cease at close of the growing season. It also should be shallow.

Mr. KNISELY: Mr. COMINGS puts the Bosc first, above all others. It is difficult of propagation and so is not cultivated by the nurserymen.

A member spoke of pear trees he had seen at SEBASTIAN SMITH's, in soil too stiff for cultivation. The fruit was the finest show of the kind he ever saw.

Mr. MARS: I have a neighbor who grows the Bartlett largely and some

Clapp's Favorite. This man has said that were he to set 1,000 pear trees, they would all be Bartletts. There is no blight in the pear in that vicinity. The Bartlett is grown principally, and all growers cultivate more or less. I know of one uncultivated orchard which was entirely killed by blight.

Mr. PEARCE: If it is true, as I have read, that the Bartlett is a poor fertilizer, it would be better not to set a lot of 1,000 in one place and without other varieties near. I would grow grass in the meadow, and fruit of all kinds in cultivated fields.

Mr. BROWN: The Kieffer is liked by all who grow it near me, and I like it. Leave it upon the tree until cold weather, then pick and lay by till December, when it becomes yellow as gold and has a flavor I like, spicy and vinous.

Mr. WHITEHEAD: It is superior for canning.

Mr. JENNINGS: I am a beginner in pear-growing, but near me are some trees of a kind they call Belle, on trees planted at an early date, which bear yearly and heavily of large, white-fleshed fruit, and one of them one year had on \$40 worth.

Mr. LYON: They are probably the Windsor or Summer Belle. This pear is a fair bearer and grower, but almost before it is ripe it is rotten. It is good to sell those who do not know anything about it.

#### CHAPTERS ON ROAD-MAKING.

The society proceeded to consideration of this subject by listening to the following series of papers:

##### A LETTER FROM GOV. RICH.

*Lansing, Feb. 24, 1893.*

EDWY C. REID, Esq., Allegan, Mich.,

DEAR SIR—This subject of good roads is attracting widespread attention. That better roads are desirable, especially during the muddy season, is unquestioned. As to the best method of securing these, without unnecessarily increasing the burdens, especially of farmers, is a question not so easily answered. It is probable that at no distant day some of the roads which are traveled more may be macadamized, and made perfect all the year around. If it is not practicable to do this on all country roads, but it would seem to be time for some improvement in the system of working roads.

In the most of Michigan, now, the stumps are out, and more or less draining is done, and it seems to be the right time for the founding of better roads. If there could be some arrangement made for a county surveyor to lay out the necessary drains, provide for the lines upon which the roads are built, and the form of the road-bed, and set the grade-stakes, so that what work was done would be toward a completion of it in the end,

it seems as though we could rapidly secure good roads without any material increase in the burdens of taxation. If this were done it would lay the foundation for a road which could afterward be macadamized or graveled or covered in some other way so as to be passable in wet weather. There are many places in the state where there are either sand or field stones, which, if broken up and only a portion covered each year, would soon make us better and more permanent roads, and roads that could be used all the year round. Farmers do not have to draw their products so far to market as formerly, but if the roads were in such condition that they could draw larger loads when they do go, with less wear and tear on the team and wagons; and if they could haul products at a time when the ground is too wet for field work, it would be a material saving to our farmers and would justify some increase in the burden of road tax for a time for the purpose of accomplishing it. There is an effort being made in New York and New England for a marked improvement in the highways, although in many particulars they have much better roads than our own.

This is a matter which I think the granges, agricultural and horticultural societies, and farmers' institutes should discuss. There is a wide divergence of opinion as to how this should be done. There are many who would be willing to do anything if there were no increase of taxation, but it seems to me the more this is discussed the more plans for the improvement of highways will be given.

The last legislature provided for a highway commission, to report some method of improvement of the highways. It seems to me the plan proposed is too elaborate, involves a radical change in our laws, and too great an expense to our people, to be adapted to our present situation. Their report has been made to the legislature, and it may lead to change in legislation that will remedy the evil and bring about a result so much desired by our people, to provide a road that can be used at any time with comfort and security.

Respectfully yours,

JOHN T. RICH.

PAPER BY R. J. CORYELL, MICHIGAN AGRICULTURAL COLLEGE.

A good dirt road is composed of two essentials: A smooth, non-wearing surface that is impervious to water, and a dry foundation. Good gravel fills the conditions for the surface, and its wise use is and probably will be the best means of road improvement for most roads. It fills the conditions because, when packed, it presents a non-wearing surface. Its interstices are soon filled with its dust or finer ground particles, and it soon becomes impervious to the surface water. The thicker the gravel is applied the better. In no case should it be less than ten or twelve inches, and as it diminishes in depth from one half to one quarter on packing, it should be from twelve to fifteen inches deep as it is first unloaded. A cross-section of the road should show the gravel similar to the cross-section of a double convex lens. If the surface of the foundation is left convex, it will yield more or less under wear, and will be broken into by the gravel, the wheels will form ruts, the water will penetrate, loosen up, and mix the gravel with the subsoil, and no repairing afterward will make it as good as before, without sifting and separating. Before graveling a road, the loose dirt should be removed and the road-bed be left slightly

concave. It will then hold the gravel and not give away under it. By graveling the road about ten feet wide, and the same grade continued by the sodded roadside for five feet on each side, a road will be obtained cheaply and thoroughly satisfactory. It will be quite permanent, with some care to keep ruts from forming.

The criticism upon roads as commonly graveled, is this: The gravel is spread too thin. It finally wears through and becomes mixed with the soil, and loses its power of cohesion and its imperviousness to water, and when afterward repaired by another thin coat it is of no more use to the latter coat of gravel than the subsoil itself. Build thoroughly so far as time and money will permit, and what is once done right will last.

The necessity of a dry foundation was mentioned. Were it saturated with water, its power of resisting pressure would be destroyed and it would saturate the surface strata more or less and finally the weight of passing loads would cause the graveled surface to break through and then mud would reign supreme. This explains more clearly the point why the surface should shed the water.

Generally, the gutters at the roadside are sufficient to keep drainage water from percolating through the foundation. If, in bad cases, where the drainage water flows across the roadway, a tile be used on the upper roadside, it will answer the purpose. On springy soil, a tile on each side of the road, and one under the center, even, is frequently necessary.

By use of road machines, as good roads can be made as the subsoil of the land is capable of resisting wear. Generally they are the means of making roads poor much faster than can be done by the plow and scraper.

The points to observe are easily given:

1. Put nothing in the road but subsoil.
2. Get this subsoil from the further part of the gutter, which will keep the grade uniform.
3. Do not disturb the sodded portion lying just outside of the road-bed.
4. In repairing or retouching the road, when once built, scrape off the portion that is worn loose, and carry it beyond the gutter, also carry with it the sediment that has collected in the gutter, and return to the road fresh subsoil. Never on any account return the sediment of the gutter to the road again.
5. Move but little dirt at a time and keep the teams going.

I have spent considerable time in riding a road machine, and believe these points contain some truth.

Will we ever have stone roads, or roads made of crushed stone? I think so, when our laws are made so that the money can be justly raised and the roads built under competent supervision. My former home annually shipped thousands of carloads of stone to the cities. Crushed stone cost them about 80 cents to \$1.00 per load of two tons; forty cents per load for drawing, and about the same for crushing. The stones were of the "hard head" variety, picked from the fields. They were given away by the farmer. The wearing parts of the crusher broke too frequently to be entirely satisfactory, but as they were made in sections and easily put into place, not much time was lost. A smaller-size crusher could be easily set up and run near where the road is to be built, and it is hoped that the stony roads of some of our counties may be more satisfactory than at present.

Our need of good roads is so self-evident and so universally acknowledged that any lengthy argument to show the fact seems almost a waste of time. Still, something must be said, that those who make our laws may know what are the wishes of the people. While rapid progress has been made in all other directions, for means of travel and the hauling of the products of the country to market, only very slow progress has been made for the same purpose in improving the common roads of the country, and in reality no progress in bettering the condition of our roads for use during fall and spring. In many places the roads in fall and spring are worse than in their primitive condition. For over fifty years there has been a lack of system for the improvement of the highways. Our present laws give us in reality no system. The state as such has taken no interest in highway improvement. It has provided for the taking of land, for electing commissioners and appointing overseers, and for a labor tax, and for local taxation for improvements and repairs, but has not defined how a road should be built, nor has it made provision for any first-class roads, leaving it entirely with the highway commissioner and the overseer of highways to make such roads as their fancy may choose. The result has been, there is no uniformity in the highways of the state, and no first-class roads for any great number of miles. The state defines how a "toll road," owned by a corporation, shall be built, but on its own roads, for all roads are really state property, it lays down no rule for the guidance of the thousand officials who supervise the work; nor does it provide for the building of any first-class roads for any given number of miles, no matter how great the necessity may be for such roads. In the state are nearly 1,500 highway town commissioners, and over 25,000 overseers of highways, each one of whom makes that part of the road in his district according to his own notion or whim, and without any regard whatever as to how the road in the next district is improved. The state exercises no authority over its roads dedicated to the public, by defining how and of what material the same shall be made, nor does it provide for establishing grades nor for the employment of competent overseers or engineers.

In order to secure good roads we need further legislation, such as the light of experience in this and the older nations would suggest. No people and no nation has secured permanent, first-class roads for any great portion of the country by depending on local taxation. In all foreign countries, in their early history, the same idea prevailed that has been the governing one in this country: that is, that the farming community must build the common roads of the country for the benefit of the public at large, the larger share of the wealth of the country being excused from giving aid. The farmers, unorganized, have submitted and built such roads as their means would allow, and no good, permanent roads have been built in any country until the bitter wail of the people in behalf of better highways has been heard by the state and nation, and such aid given as would, with the help of the farming community, secure the object desired. In our own state, the laws for the last fifty years have been such that two thirds of the wealth of the state has been exempt from any taxation for the improvement of the public highways. At the present time the assessed valuation of the state, including railroad and other corporate property paying specific taxes, is about eighteen hundred millions. Of this amount only about six hundred millions pays any tax for the benefit of the public highways. The

twelve hundred millions are entirely exempt. The burden is all laid at the door of the farming community. The farmers, during the last fifty years, have given in land over twenty million dollars for highways. They have expended on the same, in labor and money, over one hundred millions. Much of this has been wasted because there has not been enough of available means to make permanent improvement, the greater share of it having been expended in preparatory work and repairs.

In order to secure good roads we must have wise and honest legislation, such as will compel all property to bear its proper share of the burden for the improvement of the public roads of the state. Provision should be made for a common highway fund, to be made up from property which now contributes nothing for the highways—a fund somewhat similar to the primary school fund—the same to be distributed to the counties and townships, and expended under the direction and supervision of well qualified commissioners and engineers. Such aid, supplemented with the help which the farming community would then most cheerfully give, and give the same, too, in full, honest days' works, would soon see us well advanced on the highway of road improvement. And soon we might sing the following song:

Michigan is from mud redeemed,  
And by all people is esteemed  
For first-class roads as well as men;  
And henceforth "Si Quæris Peninsulam amœnam"  
Will have full meaning (although late),  
As first designed, "Behold a state."

#### HOW TO BUILD WITHOUT CHANGING THE LAW.

Upon this phase of the question the secretary read a paper of his own, showing how good roads have been built at his home, Allegan, under existing conditions.

In nearly all the discussions upon this interesting and intensely practical subject of road building, alteration of the present laws as to highways is assumed to be the beginning of wisdom. At least I never have heard of a discussion that did not proceed more or less upon that basis. I have never heard it claimed that the present system is adequate, under any conditions, to secure the results so much desired. Hence I prepare this short paper to show that, however defective those laws may be, they are sufficient, when executed in the right spirit, to provide excellent roads, though perhaps not dividing the expense thereof as equitably as might be. So, if in its culminative and inscrutable wisdom, our legislature does not materially alter these statutes, the friends of road reform need not altogether despair.

Under any system, an awakened and dominant public sentiment is the primal requisite. Without it, good roads will not be built, no matter what the laws; for roadbuilding is especially a matter of local self-government, and must needs remain so.

The village of Allegan, with a population of 3,000 people, is in a most unpromising situation for economical roadbuilding; and just in proportion to the difficulties were the needs of better highways. For many years the old plan of frittering away the efforts and the cash by numerous patches, all around the roads and streets, had prevailed, and the state of the ways went on from bad to worse. But in 1886 a different policy was adopted.

Northward from the town ran the Monterey road, and for two miles it was as wretched a piece of sand as this state afforded. I will not except any equal distance in the whole state that ever came under my observation. Besides being so sandy, it was very hilly, making passage over it slow, toilsome, and expensive of both time and material. It was the dread of everyone obliged to traverse it. One mile of the two was within the village, the other one in Allegan township. Work began by the town-meeting appropriating \$2,000 for the grading of the second mile, the condition being that the graveling should be done by contribution of the work and cash. It required all the appropriation to grade that mile. Meanwhile the village graded and graveled its mile at a cost of \$2,500, the work in each case being done by the day, under supervision of the officials, perhaps not the most economical way. A subscription paper was circulated in the village, and several hundred dollars raised in that way, while the farmers contributed work of men and teams, the contributors receiving the benefit of hire for the paid labor, so far as possible. The result was the completion of two miles of excellent road the first season—the only piece of thoroughly built roadway in the county. The total cost of the two miles, contributed labor included, was not far either way from \$5,500.

All the work here referred to was done under supervision of Mr. CLARK COLLINS, highway commissioner, who was aided and advised by the supervisor, Mr. A. E. CALKINS.

Very wisely, the officials determined that, as this road would be in great measure the pattern for other improved highways in the county, it should be made on a generous scale, so the grade was made thirty feet wide, and although there were numerous and good-size hills, the ascent nowhere exceeds seven feet in one hundred. The gravel was spread twenty feet wide, and one foot thick, a trifle thicker in the center and thinner at the edges. Tile for drainage was laid wherever necessary. So great was the satisfaction of the public with the results of this experiment, that the work was continued the next season, and yearly to this day. The adjoining township of Monterey took up the work at the line, and has carried it on northward, until now nearly eight miles of the best of graveled turnpike is established. It never breaks up, no matter what the weather. One may trot along upon it when diverging roads are all but impassable for mud, or when the heats of summer have made the sand nearly as deep and tiresome. But this is not all. We had other roads nearly as bad. The policy of taking one of them in hand each year, or a portion of one, was continued, and the village adopted the same policy with the connecting streets. No money was wasted in temporary repairs, save such as could not possibly be avoided. This has cost the township from \$3,000 to \$6,000 yearly, but there is no complaint that it has been a bad investment. On the contrary, sentiment in favor of continuing the work is stronger than ever. The township has adopted the policy of grading any piece of road which the farmers chiefly using it would gravel. The work of graveling is generally done in the lull of farm work between wheat harvest and seeding.

There are now in the township, exclusive of the village, fourteen miles of completed road, with an additional three miles graded. The grade is generally like the original piece, so far as degree of ascent is concerned, but in some parts the gravel is sixteen feet wide instead of twenty. Nowhere, however, is the gravel less than one foot in depth. The average

cost of grading and graveling is not far from \$1,800 per mile, donations included, of course.

How well-grounded is the sentiment in favor of good roads, may be judged by the fact that it cost Monterey township fully \$1,000 each to grade two hills. If you think this is not good proof of satisfaction with the work done, consider a moment how hard it is in the average township to get any appropriation at all for such improvement, and then measure by it this expenditure for a few rods of roadway, repeated the next year.

There are not many towns in southern Michigan where such improvements are so costly. So, when you try next spring to start the work in your town-meeting, you need not frighten your neighbors by quoting these figures as the approximate cost everywhere. Allegan is built in the river valley and surrounded by hills in every direction, and this Monterey road runs over a region where the earth was piled in fantastic shapes in the glacial times, and road-building over it is a far more difficult and expensive work than in most townships of this part of the state.

I only wish the doubting and unprogressive men here, those staying at home from lack of intelligent interest in their own welfare, could see what we have done. There would be less need of changing the laws, and less difficulty in getting liberal appropriations at the town-meetings this spring.

#### THE BOND DISTRICT SYSTEM.

MR. MORRILL: Our laws are such that only a small amount of money can be raised by bonded indebtedness, so a change of the constitution is necessary before very extended improvements of roads are possible. The people of New Jersey and Ohio are in advance of others in the matter of road building. The Telford system of road making is a base of rocks, then crushed rock, then more of the same material but finer, until the whole is eighteen inches thick. Such roads, or those of the McAdam style, could be built here at a cost of \$4,000 per mile. The plan of raising money should be the bond-district system, the district for taxation being one mile wide on either side of the road, all the work being done under direction of the county commissioner. A majority of the freeholders is necessary to a petition for the bonding. The plan of distribution of the tax burden is this: sixty per cent. of the bonds are payable by the district, forty per cent., by the county at large. The bonds run twenty years at six per cent. only interest being paid for ten years and then one tenth of the principal each year. The interest amounts to twelve or thirteen cents per acre, in the district, and twenty-two to twenty-three cents per acre when payment of the principal begins. The people along the road get the benefit of wages for the labor in building which lightens the cost somewhat.

MR. BROWN emphasized the position of Mr. BAILEY, that the villages and cities should help build the roads.

The report of the committee to which was referred the drafts of yellows and black-knot laws, here made report, and their findings were adopted, Mr. MUNSON suggesting a provision for a county commissioner to see that township and city commissioners do their duty.

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*Thursday Morning Session.*

The final session of the meeting began with Mr. C. J. MONROE in the chair. The initial subject was opened by the reading, by the secretary, of the subjoined paper, by Mr. THOMAS L. BROWN of Grandville, upon

TRUCK FARMING IN MICHIGAN.

Those unaccustomed to market scenes in Grand Rapids can form but a faint idea of the amount or quality of the garden products that daily change hands in this great central market. A favorable combination of circumstances in every particular branch is the cause. In the first place, the position of the city is such as to make it a great distributing point. Blest with railroads and rival express companies, her perishable goods are daily and easily sent in all directions, while the whole of the country north, which is rapidly gaining in population, relies upon Grand Rapids for its supply of early fruits and vegetables. During the past five years the number of new growers has so largely increased upon our market that the old growers look about in astonishment and say, "Where are we?" Diversified cropping is generally practiced, with here and there a specialist like JEBB, with his twenty acres of celery, and others with celery and onions. The problem of a city market is still seriously pressing itself on grower and citizen alike.

NEED OF A MARKET-PLACE IN GRAND RAPIDS.

In his address before the Farmers' club and Grand River Valley Horticultural society, President JOSEPH A. PEARCE vividly described the need of a market by asking, "What would be the result should a fire occur in the immediate vicinity of our present meeting place? What a fearful holocaust would there be enacted in case of an actual fire in that quarter! The engines would be powerless to assist, for they could not possibly make through the street." At that meeting it was thought the "Island could be secured; here was the only feasible place, the bridge project having been abandoned on account of the limited amount of space possible to afford. This matter is now under advisement to the common council, and it is hoped some good may come from the many efforts of ours and kindred societies."

The country immediately tributary to Grand Rapids is so diversified in character of soil as to make it possible to bring all kinds of vegetables to

perfection, and were I permitted to speak of our fruit interests I should say that a similar state of affairs exists; from the highest hills to the lowest valleys, every kind of fruit indigenous to this latitude grows in abundance and thrift, making the "horn of plenty" full to overflowing.

Within the gates of the busy Valley City are stabled thousands of horses, manure is cheap and abundant, and in some instances barns that make three hundred loads per year can be secured for drawing it away. Most of our large cities are situated with a body of water on one side of them; this drives the building a long way out in other directions, thereby compelling growers to carry on their business at a distance from the city. Seeing a wagon loaded with manure in Chicago the other day, I asked the driver how far he hauled his load. "Sixteen miles," said he. Our growers declare it does not pay to haul seven miles. Why is it? The only answer is, superior advantages make them look at it that way. Nearly all the gardening around Grand Rapids is within a radius of five miles from the city.

#### HOLLANDERS MONOPOLIZE THE BUSINESS.

But chief among the causes for the present state of development in market gardening around Grand Rapids, and in fact for all western Michigan, is the class of people into whose hands the business has fallen. On October 2, 1846, the first band of Hollanders destined to form a colony in Michigan set sail on the ship "Southerner." It was the intention of their leader, the faithful A. C. VAN RAALTE, to locate in Wisconsin, but detention in their pilgrimage caused their leader to select western Michigan for the colony. Here they settled and after a time prospered. Professor CALVIN THOMAS of the Michigan University shows by the following table the rate of increase of Hollanders in Michigan:

1851-1860 .....	10,689
1861-1870 .....	9,539
1871-1880 .....	17,236
1881-1888 .....	43,916

There are now over 100,000 Hollanders in the United States, nearly half of them in western Michigan. No other class of foreigners are so naturally adapted for settlement and prosperity in subduing both swamp and forest as are Hollanders, but it is chiefly due to their indomitable perseverance and contentment that the thousands of acres of seemingly unapproachable bog have been converted into the choicest garden lands.

Beginning around Grand Rapids and traveling in a southwesterly direction to Holland, thence up the lake shore as far as Muskegon, the whole country is now rapidly passing into the hands of the Hollanders.

What has become of our earlier American and English growers? Many have gone south, some to California, and those remaining have sought a higher branch, that of horticulture under glass. In this branch Grand Rapids leads all other cities in the west. Our growers are thoroughly active men and produce goods that sell in competition with any of the larger cities. Grand Rapids is as proud of her contiguous greenhouse business as she is of any of her varied wholesale pursuits.

## TRUCK FARMING HAS A BRIGHT FUTURE.

As to the future of truck farming in western Michigan, the brightest outlook is before us. Never has there been so much produce raised as the demand has called for. Each year Illinois, Indiana, and Ohio draw on our supply, and with the rapid growth in the population of the cities in those states, and also in the increase in our home market, comes with each recurring year increased demand. Cabbage, potatoes, onions, and celery are always wanted in the fall in carload lots, and I expect to see in the near future produce companies formed for the purpose of supplying in a measure this increased demand. Hundreds of bushels of string beans found a market in Chicago last summer at good prices. This year our growers expect to find a great market in the World's Fair city. Between Grand Rapids and Grandville on Grand river are hundreds of acres of the choicest lands suitable for gardening. Barges for drawing manure can be bought for the price of one good horse, and the soil is the very finest even to the water's edge. These lands will very soon be utilized for gardening purposes on a large scale, as they can now be purchased at a nominal figure. Grand Haven is still able to produce plenty of good celery, but the day must come when that city will fall off both in quality and the quantity of her crop. That venerable leader, GEORGE HANCOCK, who last year had over twenty acres of celery and twenty acres of tomatoes, said the subject of fertilizers was a serious one. To grow such an amount of produce required lots of manure. This was hard to get in Grand Haven, and they, like Kalamazoo, would look to Grand Rapids for a supply of manure. Thousands of loads of manure are each year burned on the dumping grounds of our city that ought to find its way to barges, and thence to the lands adjacent to Grand river.

## THE STATUS AT BENTON HARBOR.

MR. J. N. CUNNINGHAM: Our home market, here, and the Chicago market are practically one and the same. Our chief need is fertilizers—they are the one thing now lacking—but these will be supplied. The outlook is bright for the truck farmer in western Michigan. There is certain to be an increasing demand for his products. Here at Benton Harbor the two pickle factories will absorb an unlimited amount of cucumbers and tomatoes. I have found that cucumbers will net \$100 per acre—they have done so two seasons for me. Truck farming in Michigan is really in its infancy, and the demand for its products seems practically unlimited. The annual product of cucumbers, tomatoes, muskmelons, potatoes, etc., grown and shipped from this place is enormous. There is a daily shipment of melons for six weeks, by hundreds and thousands of cases, and there is a great acreage of tomatoes planted yearly for the canneries. Truck farming is a good business if rightly managed, but we must learn from the Hollander to have less acres and more product. One fault of the American is that he will not work so hard as the Hollander, and so makes less gains. We have a great advantage here in western

Michigan, over the gardeners close about Chicago. They have to haul their product sixteen miles, getting up very early and working hard to make ready their loads. We get ready the day before, send the goods in the night, and are preparing our next shipment while they are waiting to sell their loads. We grow no celery to speak of, here, though there is a great marsh near the city. None of it is utilized. Some celery has been grown, however, and it was free from rust. The marsh is a gold mine for celery growing, but the business men are trying to get it covered with factories. Some onions, lettuce, radishes, etc., are produced, especially onions, and last spring we got \$4 per bushel crate for bunch onions. There is a large acreage in preparation for this spring, of these crops, which will be increased hereafter. The tomato worm is becoming a serious pest, on potatoes as well as tomatoes, and we have to fight for both. Arsenical spraying may be effectual. The trucker has to work harder than the fruit-grower, and perhaps for less money. Tomato rot troubles some, but we have never done anything for it. Only the fruit from the early settings rots, and I know of no help for it. In planting cucumbers we plow the ground finely, using a single plow, putting the manure into the furrows, and then harrowing, drill in the seed, leaving the plants fifteen inches apart. We use pyrethrum, sulphur, and tobacco for the striped bugs. We can compete with any place in the country even with greenhouse vegetables. Mr. BUDLONG of Chicago, a hothouse vegetable grower, says the men of his kind have the market till the open-planted product from the south arrives.

#### WRONGFULNESS OF SECRET METHODS.

It was noticed that the speaker was very chary about giving knowledge of his methods, and when asked about them he frankly declined to "give away the secrets of his business," and said he noticed Mr. BROWN had carefully avoided telling anything of the sort in his paper; and he instanced Mr. MORRILL's free gift of his processes in originating and growing the Osage muskmelon as an example of what a grower should not do in this matter.

Mr. W. A BROWN: For all the secretiveness of some of our people, this is becoming known as a horticultural region in the broadest sense of term. One of our factories consumes the daily product of 1,000 acres of cucumbers. The whole volume of our product is much greater than is commonly supposed. We can get no statistics of shipments from the principal boat line, because the owners do not care to have it known how much money they make.

Mr. THOMAS MARS said he had learned more this morning of the methods of truck farming, than he ever had known before, and he highly praised the generosity of Mr. MORRILL in letting the whole people know of his methods, and for his investigations which had conferred so great benefits upon his fellows. He maintained it was the duty of every man to thus help others, instead of selfishly keeping to himself the knowledge which would make thousands happy and prosperous.

Mr. CUNNINGHAM told how, when he was selling a few radishes, the fruitgrowers had geyed him about his "green stuff." At the same time he sent to Chicago with his "green stuff," fifteen or twenty crates of strawberries, which hardly paid expenses, but his radish crop paid more than did fifteen or twenty acres of strawberries. "So, if I am secretive, I must not be blamed by the men who disdainfully looked upon my beginnings."

#### SQUASHES: HOW TO GROW AND KEEP THEM.

The secretary read the following paper by Mr. S. S. BAILEY of Grand Rapids upon cultivation of squashes:

##### HOW TO PLANT.

Select well drained sandy or gravelly loam, well enriched, such as would raise a good crop of corn. If the ground is not rich it should be made so with well rotted stable manure, cow manure preferred. Fit the ground thoroughly as for corn; plow furrows ten or twelve feet apart across the field for the rows. In the furrows, about every nine feet, shovel from the wagon half a bushel or more of manure, well rotted all the better, and as rich in nitrogen as you can have it. When planting, scatter with the hoe part of the manure in each hill along the furrow; mix the balance with fine soil and firm the same with the foot; plant the seed and cover with one inch or more of fine rich dirt and press lightly with the hoe. The covering must not be wet, only moist; otherwise a crust will form and prevent the seed from coming up. Put in plenty of seed. As soon as the plants are well up and the bugs begin to come, examine each hill and vine daily, and oftener if necessary, for the striped bug. Catch and kill all you can and be spry about it, or they will be gone like the paddy's flea. Dust the plants with plaster or ashes or road dust; a little Paris green with the same is recommended. In a few days, if you have been vigilant and faithful, you will have conquered this enemy; but now comes the greatest enemy to squash-growing, the big black or brown stink bug. When they appear you must be on duty early and late for a few days until the first comers are all killed. Search every hill and plant and the ground adjacent, and kill every bug with thumb and finger. Be quick about it so that none get away. They will play "hide and seek" with you, and unless you are equal to their cunning many will escape you. Don't stop to blow your nose until you get where you can wash. Examine every leaf and destroy any eggs that may be found, and thus prevent a second crop. While examining the hills, stir the soil in the hills with your fingers—by doing so you will cultivate the plants and find such bugs as are in hiding. After

the first few days you will find but few bugs, but still keep up the search until the vines have commenced to run and are well started. From time to time thin out, removing the poorer plants, until there remains only from one to three plants, the condition of surrounding hills to be considered. Commence cultivating and hoeing as soon as the plants are all up and keep the ground well tended. Until the vines begin to run the two-horse cultivator or drag can be used. While cultivating and hoeing, fill up the furrows until all is level. When the vines begin to run you can aid them in covering the ground by turning them in the proper direction, but don't disturb them after they have made a few feet of growth, for if not disturbed and the ground has been kept mellow they will take root at nearly every joint. Just here is one of the secrets of success in raising squashes. If the vine has taken root near where the squash has set you will be very sure of a good squash at that point. This rooting at the joints enables the squashes to get food for growth over a large surface, and thus utilize all the rich soil and gather moisture over a large surface.

If one desires, he can plant a row of sweet corn midway between the rows or hills of squashes, and I think with benefit to the squashes, as the vines are constantly reaching out for something to cling to and seem to do better when they can get hold of something. The sweet corn is all clear gain, as it occupies the ground only at the end of the vines. My best late sweet corn is thus raised without any extra expense except for the seed.

Early planting, before the ground becomes warm, invites feeble growth and swarms of bugs. Here is where many fail unless they give extra care. I have had best success, one year with another, in planting the first three weeks in June, depending on the weather or season.

#### HARVESTING, STORING, MARKETING.

Watch for early frosts and gather before injured; put in small piles and cover lightly with stalks or straw or vines, or remove them to the barn; handle carefully as you would eggs; cut the stem from the vines with a knife. Put straw or hay in the bottom of wagon when gathering. Wagons with springs are the best. Store in a dry place away from any damp or mouldy substances. At the beginning of winter store what are not marketed in any dry place free from frost, where the temperature will be kept quite even; avoid a damp cellar or any cellar in which there is any mould or musty substances. For family use keep them anywhere in the house where they will not get frosted. They are clean vegetables and will do no harm in any out-of-the-way place—in the hall or closet or under the bed! They will keep longest near the chimney or stovepipe, but may lose a little in quality if kept too long. Those picked just before fully ripe keep the best—those picked early to show at fairs are nearly always the best keepers. Where very large crops are raised, a squash-house is indispensable. With such I have had no experience. Such houses when built should be frost proof and so planned that the air can be kept dry and of an even temperature.

If you value your reputation, don't sell squashes that have been frosted or that are poor keepers unless you advise the buyer of the fact so that he will use them up before decay commences and he be saved from loss. In marketing, don't sell to any groceryman or dealer who will keep them for any length of time in a damp cellar or in any damp, mouldy, or musty

place, as he will be sure to lay the blame on you for the squashes spoiling, as they surely will if kept long.

#### GOOD VARIETIES.

The best varieties for fall are Boston Marrow, Turban, and Essex Hybrid, though the winter squashes are equally good for late and many prefer them. The best for winter are Hubbard, Marblehead, Putnam, and Pike's Peak. The Hubbard is in most demand for market. The Pike's Peak is the best of all, both early and late, and the best keeper. Squashes grown on low ground, rich in vegetable mould, will not have the quality nor will they keep like those grown on high table-land.

Fall and winter squashes are among the best vegetables raised, and every family can have a full supply from early fall till late spring if the farmer and market gardener will in timely season plant plenty of good seed in well-prepared, well-enriched, warm land. Cultivate the same often and thoroughly; be vigilant in destroying bugs; pick before frosted, and handle with care. Keep dry and free from frost. Supply customers as carefully and honestly as you would supply them with eggs.

I have tried to give you the price you must pay for success. If you are willing to pay the price you may reasonably expect to receive a rich pecuniary reward that will fully compensate you; and in addition many thanksgivings, not only from your own family and friends, but from many a family whose good fortune it has been to be among your customers, and double thanksgivings from such of the poor as you have gratuitously supplied from the bountiful harvest.

#### QUESTIONS IN GREAT VARIETY.

Following this paper was the opening of the question box, the secretary reading the queries and members responding in the following order:

*Shall we cultivate our strawberries in the spring?*

Mr. HANDY: No; mulch in the fall, remove in the spring, and cultivate after picking. Mr. MUNSON's advice was the same. Mr. BROWN would cultivate a young bed somewhat. Mr. MORRILL would do the same, but would burn the mulch and cultivate till October.

*How shall we fight the curculio?*

Mr. PIXLEY: I have sprayed with carbolic acid (a teaspoonful in a pail of three gallons of water) and have thought that the smell of the acid was what kept them off; noticed no ill effect; sometimes put in the same amount of ammonia as of acid.

In Oceana county we jar only, thinking spraying not reliable.

Mr. W. A. SMITH has used spray several years and has not failed, in that time, to have a good crop of plums; uses one pound of London purple to 200 gallons of water, with three or four pounds of lime milk; and though he has been so free from them, curculio were plentiful in the neighborhood; has used the chip traps (corncobs instead of chips) and this is an excellent way before the leaves come, but he depends upon spraying after he begins it; he kills thousands so; he will jar also, for the peaches, and use corncobs, but believes spraying upon the peaches may be successful.

Mr. MORRILL: Mr. SMITH succeeds with spraying for curculio, because

he is thorough in his work; others fail with it; Mr. WILLARD of Geneva, N. Y., relies upon jarring.

Mr. CUNNINGHAM: Instead of carrying the curculio to the "peanut roaster," as Mr. WILLARD calls it, let them drop into water with a little kerosene oil in it; and treat the squash bugs the same way—don't pinch them.

Mr. MORRILL: Milk of lime in the spray neutralizes the arsenious acid. It should always be used—one pound to 200 gallons of water.

Mr. SMITH: One pound to 300 for peaches, and upon these use Paris green instead of London purple.

*What are the best varieties of grape, to extend their season, and how long, with proper care, can their season be continued?*

Mr. MERRY: I grow Concords, chiefly, and so don't know.

Mr. W. K. MUNSON: I grow the Concord, Worden, Brighton, and Niagara. I keep all these but Worden, filling my house and delivering 1,000 baskets at Thanksgiving; there is more profit in keeping three to six weeks than keeping four months; I repack into smaller baskets in two weeks, removing the broken and bad grapes; would set these four varieties; my grape-house is dark, the walls filled with sawdust, and is ventilated by tile laid six feet deep and leading 200 feet away, the end covered to keep out vermin; keeps in climax baskets only; the temperature is kept at fifty-five degrees.

Mr. LYON: I have kept Delaware till now (March 1); Jefferson is of good quality and keeps well; none keeps better than the despised Diana, which loses its odor and improves its quality; by use of Delaware, Iona, Diana, Isabella, and Catawba, the grape season may be extended to April.

*Can garden truck be grown with complete fertilizers without the aid of barnyard manure?*

Mr. CUNNINGHAM: No, it can not, year after year.

*In planting pear and apple seedlings, this spring, for budding next fall, should they be cut back when planted, and how much?*

Replies were that it is customary to shorten one fourth to one third; is dangerous to wait till fall for budding, but do it in August and not cut back unless very large. Mr. MUNSON: Cut the roots to seven inches in length and the top off as far above the ground, and trim to a whip.

*Do we practice root-pruning as much as we should? Is it beneficial?*

Mr. CUNNINGHAM: I have root-pruned pears, in plowing for vegetables, and had a full crop every year since; plowing was done in the spring. Mr. COMINGS suspected the cultivation had something to do with it. Mr. MORRILL thought root-pruning no better than "horn pruning"—the nipping of cattle.

*Should all the tight and loose stone be removed from the orchards?*

Mr. MUNSON said he takes out every stone he strikes, both on account of the tools, and to sell the stone. No one seemed to have an idea as to benefit or damage.

These questions concluded the session, and the meeting adjourned.

# PROCEEDINGS OF THE SUMMER MEETING.

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HELD IN SHELBY, OCEANA COUNTY, JUNE 14-15, 1893.

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At Shelby, Oceana county, the 14th and 15th, was held the summer meeting of the State Horticultural society, and a highly valuable season it proved to be. The attendance was very large, for such a busy time for the farmers, the largest the society has had in many years at a summer meeting. A comfortable hall was provided, and the people of Shelby and vicinity supplied everything needful to the comfort and pleasure of the visitors. One of the prettiest features of the occasion was the abundance of lovely flowers provided, some of them by Prof. L. R. TAFT, from the grounds and greenhouse of the Agricultural college, but hundreds more by the ladies of Shelby. There was an exhibit of half a dozen or more varieties of apple, by Mr. W. B. ANDRUSS of Allegan, all in good state of preservation though not kept by cold storage.

President LYON called to order at nine o'clock A. M. of the 14th, and requested Vice-President MORRILL to preside, which he did, throughout the meeting.

First in order was a paper by BENTON GEBHART of Hart, hereto appended, upon

## HORTICULTURE OF OCEANA COUNTY.

Horticulture in Oceana county, you may truthfully say, it is about everywhere—in every nook and corner. Not only is the culture of choice fruits practiced by nearly all who till the soil as a common occupation, but the birds of the fields and lofty woodlands seem to proclaim, with their sweet songs and tones of praise, of horticulture everywhere—horticulture on the hill tops, horticulture in the valleys, horticulture in the village lots and places of business. So is horticulture, or growing of fruit, a common study and delight with all.

In giving you a few points as to fruit culture in Oceana county, I need not dwell on our grand climate and natural lay of the land; nor the variety

of soil, which we have for all fruits, and that to a large extent, for many of you are well aware of our grand location. But within this limited paper I will try to interest you as to my own experience and the observation of others in the way of successful and profitable fruitgrowing in Oceana county.

In the first place, I wish to make particular mention of the great success with which we meet in growing all the varieties of excellent fruit, from the wild huckleberry or Juneberry up to the king of all fruits, the apple, as they all succeeded wonderfully in point of growth and productiveness. All the small fruits, including the strawberry, raspberry, currant, gooseberry, and grape, do well and are at home with us. More especially the raspberry, currant, and gooseberry are "just immense" in any favorable season. But I will not take up your time and dwell longer on the culture of small fruits.

You are perhaps nearly all waiting to hear something said about the staple industry, the culture of the peach and plum, in this the banner section of country for the growth of these superb fruits. We claim Oceana county has no rival in our own state, nor anywhere in the northwest, in this respect. At least it is so conceded by many prominent fruitgrowers. My experience and observation of growing fruit dates back to the seventies, while quite young in the matter of fruitgrowing. Bearing peach or plum orchards, with us, in those days, were rather a rarity, and quite a curiosity. Only a very few trees or orchards, to my certain knowledge, could be seen (now and then a few cherry trees and apple orchards) except that my old friend, Mr. ERWIN STANHOPE, had a fruit garden and largest and best peach orchard in Oceana county, and he still holds his reputation as to a fine and profitable orchard of peaches and plums. To him the writer owes many favors and compliments as to early encouragement and instruction as to fruitgrowing being above all other choice for tillers of the soil, for pleasure and profit.

#### THE BEGINNINGS OF IT.

About the year 1872, the writer planted on the old Gebhart fruit farm, six Lombard, and six Blue Damson plum trees; also five Hale's Early and two Early Crawford peach trees which are nearly all alive and bearing fruit to this day, and have done so for eighteen years in succession. Several of the Lombard plum and Hale's peaches are dead and gone. In the winter of 1874-'75 many peach trees all over the country were frozen or killed dead to the ground. But the young Hale's Early peach trees, planted in the woods, bore a few peaches the following summer of 1875, after the severe and cold winter. Soon after, or about 1876 to '79, I began to propagate and set a few trees, with poor success in the first attempt to grow the trees. I set out about twenty-five peaches, all of the Hale's and Early York varieties; and when the trees were five years of age they bore twenty-two bushels of good, salable fruit, which then netted in the Milwaukee market \$4 per bushel, or \$88 for the first crop of peaches from the twenty-two trees. These fabulous prices for early fruit, and the shipping in here of Alexanders, which sold at \$1.25 to \$1.50 per peck basket, set enthusiasm wild to engage at once in the growing of the early peaches and plums; and soon many trees were set by myself and others, of all the early clingstone varieties of peach, such as Amsden, Alexander, Beatrice, Hale's, etc.; for in those days late peaches did not ripen well, and

the early sorts were all the rage as to high prices and profit. But they have not proven profitable in late years, as you all know. As, for instance, in 1879 and 1880 we planted from 600 to 800 trees, nearly all of the early varieties; and when the trees were from five to seven years of age we began to get great crops of early fruit, in number of bushels from 1,200 to 1,800, for several years. But they were not so profitable as in former times. One season the whole crop of early peaches only netted 80 cents per bushel, while the next season \$1.02 net per bushel was all that was realized for the crop. While these early varieties of peach do not sell for so much money as some of the later varieties, still they are quite profitable on account of bearing heavy crops each year. Well do I remember the first big crop of Early Crawford, as to the great mistake made and loss in marketing all of 200 bushels, which were nearly a total loss to the grower on account of being over-ripe before going to market.

#### EARLY-DAY AND LATER PROFITS.

While speaking about the history and profits of peach culture, both as to what has been done and what may be, I do not wish to pass by my choice of all large fruits, the plum. In speaking of its early history and culture, I would mention a few incidents which I call to mind. Two of the six Lombard tress which were first planted by myself, in bearing the second year netted the grower \$18; while Damson began to yield and sold well for \$5 per bushel; and while on the old fruit farm I propagated the Bradshaw to a great extent on peach root, which proved to be very profitable, both as to the growth of very fine trees and their prolificacy in bearing. In the early days of plum-growing, with us, the fruit would sell for high prices—Bradshaws from 90 cents to \$1.50 per fifth basket, and all varieties in proportion. I well remember having one tree which, when six years old after planting, for its first crop produced two bushels of very choice fruit, which netted \$9 of clear money. But other trees did equally well in proportion. While of late years the prices of fruit does not rule so high, yet the growing of choice varieties of plum is very profitable at the present day. There are many thousands of plum trees now in our county, which will soon come into bearing, and if rightly managed will prove a bonanza to the growers. As to the actual profit per acre in peach and plum growing, in our county, it is very hard to give a true estimate; but, generally speaking, I would say from \$300 to \$500 per acre can be realized. It depends largely on what varieties are cultivated, time of ripening, and favorable seasons.

As to the diseases of the peach and plum, we have but little—comparatively none. But little black-knot can be found, and that mostly on the wild cherry in swamps; also some on young trees which are imported for planting from unreliable nurseries. To my knowledge, as commissioner, we have not a genuine case of peach yellows in the county. We had peach and plum rot during the past season, quite severely, and this disease may do considerable damage. But I believe this disease can be controlled to a large extent.

#### THE BLACK-KNOT QUESTION.

President LYON asked for definite information as to their subjugation of black-knot.

Mr. H. H. PRATT of Shelby: We are not exempt from curculio; we have faithful men who are steadily killing them by the thousands—did yesterday, are doing so today, and will do so next week. I have had no faith in spraying for curculio, but last week I used Bordeaux mixture with London purple. The curculio were thick at the time of application, and a few days later I caught six hundred from twelve trees. I believe in spraying, as against all fungi, but not at all for curculio. To subdue this enemy, it is evident that we must jar and trap; and so long as the plum grows here we shall have the curculio. Mr. PRATT told of profits of \$500 or so per acre of plums; said he did not think black-knot was increasing, for he has seen but little of it. There is much of what is called black-knot in the wild cherry, but it does not seem to spread to the plums.

Prof. TAFT: I told you, at the meeting two years ago, that the black-knot of the plum and cherry were the same thing. It is still believed that they are, and I do not see how it can exist so in the wild cherry and not be upon the plums. There certainly is cause for great watchfulness, and if the knots appear they must be cut before the bark bursts and the spores open.

Prof. L. H. BAILEY: The black-knot question is a very serious one. The disease is in New York to an extent of which you have no conception and is working destruction that is disheartening. All along the Hudson river it is killing orchard after orchard, causing loss of hundreds of thousands of dollars, making plum culture impossible where once it was a source of great wealth. The disease will sometimes stay in a particular tree or orchard, and not appear to spread; yet again it does spread, and as rapidly as yellows, or more so. The only way to safety is to cut it out. It will at times be quiescent, and again spread like a prairie fire, and be equally destructive.

Mr. S. D. WILLARD of Geneva, N. Y.: While at one time we were free from black-knot in the western part of New York, it has entered and has swept away thousands of trees. For miles and miles along the Hudson river there is ruin by black-knot where once were plum orchards that paid \$1,000 per acre. Now every tree is killed, and no one will think of planting a tree. The only way to be free from it is to cut out and burn. My orchard is gone over twice each year and the knots cut out. The state of the air, as to moisture or dryness, may be one reason for the spread or the quietness of the disease. I have been in Minnesota, where they have black-knot and pay no attention to it, and so must soon lose their trees.

Mr. C. A. HAWLEY of Shelby: I cut and burn, as the only protection against black-knot. If the ground is thoroughly tilled and the grass and

weeds cut, there will be less curculio. Some varieties of plum, as Bradshaw and Yellow Egg, are more susceptible to attacks of curculio than are others.

Mr. PRATT has found the curculio worst on those varieties which Mr. HAWLEY thought freest.

Mr. A. ADAMS of Shelby: From the reports of our local commissioners, we find that black-knot is decreasing. We have been vigilant, and the trees reported as badly infected, two years ago, have been taken out. Since then scarcely any has been found.

Mr. WILLARD: There is a great difference in varieties, as to attacks of black-knot. The Bradshaw is very free, while Reine Claude du Baviay is most susceptible. Lombard is also bad in this respect, and Quackenbos is nearly exempt. Hudson River Purple Egg is nearly free. I found some in it at one time, in a single tree, and then no more for a long time, until three years ago; then another eruption, and no more since. You must feed the soil, especially here where it is not so retentive. Do not let the trees overbear, for it weakens them, and thinning really makes more fruit, and causes less draft upon the tree for seed production. There is such a thing as over-feeding with barnyard (nitrogenous) manures. This may not be so here, but it is certainly so upon heavier soils. I do not like rye and other green manures; I cultivate shallow, with harrows, among plums.

#### THERE IS SUCH A THING AS SOIL EXHAUSTION.

Prof. BAILEY: I used not to take much stock in soil exhaustion, but since going to New York I have learned differently. As a soil grows poorer, difficulties (diseases too) increase. Here you must build up fiber in the soil (it may be by rye), and so make ready for potash and other chemical fertilizers. Fruitgrowing is always easy in new regions, even as it is here. It will not always be so easy, and you must be prepared for those future evil days.

Mr. GEBHART: There is very little black-knot, save on the imported trees and the wild cherry in swamps; but the latter have been burnt over of late years, which must have decreased the disease.

Mr. ADAMS spoke warmly of the advantages of Oceana county. There is no yellows as yet, and the natural advantages for fruit production are unsurpassed. They propose to head off yellows by vigorous enforcement of the law. There is much available and unoccupied land for fruit culture, and they expect to make horticulture a grand success, by watchfulness and hard work. One disadvantage they have, however: transportation is not so good as in the counties further south.

Mr. C. A. SESSIONS of Mears: Prof. BAILEY's remarks seem strange to

us, but time will demonstrate their truth. Yet there is not anywhere a better region for fruitgrowing than here in Oceana county, as the grand show of fruit in Mr. ADAMS' orchard will attest. The plow should never be put into peach and plum orchards, after the third year, but cultivators of various sorts may be used, and used so often as to make the plow unnecessary. I use Pearce's gang plow. We shall have from half to two thirds of a crop of apples, and small fruits are very full.

#### WILL THERE BE OVERPRODUCTION OF PLUMS?

Mr. J. M. HAIGHT of Shelby: Will Mr. WILLARD tell us what he thinks as to the possible overproduction of plums?

Mr. WILLARD: This is a question I am often asked. There is a possibility of the overproduction of some varieties. The Lombard we find no longer profitable, on the whole; yet, like the Concord grape and the Baldwin apple, it is everybody's fruit. It bears a great crop, every other year, everywhere, and the markets are flooded. The very early and the very late plums are the ones from which to make money. Some varieties are desirable here that are not so with us. Yellow plums are desirable, and of these the Bavay and Coe's Golden Drop are the best. If such are not wanted here now, they will be in a few years. You can see them on Mr. GEBHART'S farm. The Fellenburg prune will do well here, and its production is not likely to be overdone. There are more than forty sorts of prune, but they all go as German; and as the west is full of Germans, they will want this sort of fruit, and feel sure they are getting just what they had in the old country. The Fellenburg is the best of the lot. It is not everywhere so successful as it will be here, and is all the better for that. Plums are all right on peach roots—that is, those which take kindly to it, but some do not.

#### BLACK-KNOT ONCE MORE.

Mr. N. B. FARNSWORTH of Shelby had never seen black-knot on plums on peach roots and he has many varieties so budded.

Mr. WILLARD could not see how that could make any difference.

Mr. SHIRTS of Shelby exhibited a large black-knot he took last spring from a plum tree on peach roots, and said he had lost many trees of that kind. He has some Canada Egg, which he likes as well as Yellow Egg. They bear heavily and so must be thinned.

Mr. HAIGHT: I have ninety Bradshaw trees on peach roots, and have cut off much black-knot from them; yet I prefer them so, for they are larger, finer trees than when on plum roots, and longer lived. I would plant deeply enough to secure roots from both root and stock.

Mr. W. D. MARKHAM of Hart: The virtue of the peach stock is, it provides no suckers, but a cleaner, healthier tree.

Mr. H. PALMER of Hart: I have plum trees both on peach and plum roots. On light soil the peach root is the better, but on heavy soil the plum root is all right.

Mr. J. B. HOUK of Ludington: Can we grow young plum trees too fast, and set them too deep on heavy soil?

Mr. MARKHAM: Some varieties do not take well to the peach root, and the Lombard is one of them.

Mr. WILLARD: There is no question but we may grow young trees too fast; a moderate growth is the better, the tree being hardier and in all respects more desirable.

Mr. HOUK said he had nearly destroyed 300 plum trees by heavy manuring and quick growth. The Bradshaw stood it the best, the Bavay next, but the others were mainly killed by the winter.

#### THE SEASON'S CROP.

Secretary REID followed with extensive reports of the status of the fruit crop in all parts of the state. It revealed a nearly total failure of the apple crop, save in the Grand Traverse region, while otherwise the prospect was good for fair to full crops, grapes being unusually abundant.

In course of a crop report for his section, Mr. B. F. PIXLEY of St. Joseph proposed the following:

#### FERTILIZERS NEEDED FOR WORN SOILS.

I hope the society will give some attention to the matter of fertilizer for our fruit trees. Probably seven tenths of all the land in fruit in this region has been cultivated to fruits for the past twenty or thirty years, and the large proportion of poor and imperfect specimens we yearly find among our fruits is undoubtedly owing to a lack of potash and phosphoric acid in the soil, which has measurably been exhausted by the constant cropping. This fact admitted, the vital question is, how can these elements be the most easily and economically supplied to the soil again? By correspondence I have learned that muriate of potash, eighty per cent. pure, could be delivered here at \$47 per ton, 2,000 pounds, in carload lots; superphosphate at about \$20 per ton, and nitrate of soda at \$55, and screened hard-wood unleached ashes from Canada at \$9.50 per ton.

Perhaps some of our scientific members can tell us which of the above would be the best for the money. That is what we want to know. Then we can club together and order in car lots, and use enough to do some good. I believe that with proper fertilization, and judicious spraying, just as good fruits and abundant crops can be grown here for all time as have been grown here for the past twenty-five years.

It is the climate that made this locality a successful fruitgrowing region. That, aided by the virgin soil, produced those beautiful, high-colored and

luscious St. Joseph peaches, which are now known only in history. The climate is the same today as it was then. If we can restore to the soil the elements it possessed then, what is to hinder our producing anew those peaches?

#### TREATMENT FOR POTATO SCAB.

Mr. L. J. Post of Lowell appended the following to his report:

I treated quite a quantity of potato with solution of corrosive sublimate, 1 to 1000, for scab. I took two oz. of sublimate and dissolved in two gallons of warm rainwater, in a wooden pail, stirring it frequently; then poured this into thirteen gallons more of water, in half of a kerosene barrel. We used three baskets, each holding one and one half bushels, filled about level full, of potatoes. Set one of these baskets into the solution, and it will fill the half barrel full, and also cover the potatoes. Let them remain a few minutes, to become thoroughly wet. Then raise them slowly and set in a common kerosene barrel with one head out. It will probably just set in without dropping down. Leave it here a short time to drain. The water can be poured back into the half barrel frequently. In using three baskets we fill one, have one in the solution, and one draining. If a good many are to be dipped, keep a second supply of the solution close by, to replenish the one half barrel as the solution is taken out by the potatoes. If the baskets are made as they are in this vicinity, the water will pass through very readily. There is no danger in handling this solution, even if there are sores on the hands, as it is the same solution used in surgery. Of course it would not be just the proper thing to drink.

#### TO PREVENT POTATO SCAB.

In continuance of this subject, the secretary read the following paper prepared by Mr. R. J. CORYELL, one of Prof. TAFT'S assistants at the Agricultural College:

Potato scab is familiar to all potato-growers. It is prevalent wherever the potato is grown, and its origin is probably in the remote past. The cause of scab was not known until within the past two years. Even yet the exact life-history of the organism that causes it has not been fully traced out. The theories that it was caused by angleworms, wireworms, manure, or by the condition of the soil, are disproven, and the fact established that it is caused by a plant organism resembling both the fungi and bacteria.

It propagates by spores which are brought into contact with the growing potato and enter it at a lenticular or breathing pore, and begin their work of destruction. Its presence is first shown by a tiny crimson spot. This coloration soon enlarges. The potato, in its effort to heal the wound, makes an increased growth of cells under the diseased portion, and tends to throw it off, which accounts for the raised surface of the scab as seen in some specimens. The disease attacking the potato earlier in its growth, and consequently having a longer time for its action, may involve the underlying tissues to a greater extent and cause the formation of cavities, which are filled more or less with the decaying mass of destroyed tissues. Worms, mites, myriapods, etc., feeding on this decayed substance, led many to think that they were the cause of the injury.

## CERTAIN KNOWN FEATURES OF THE CASE.

Since the discovery of the cause of the scab, the following points have been proven to be true. These points should be kept in mind by those that hope to successfully combat the disease:

1. The disease is of fungoid growth.
2. The planting of scabby potatoes will cause the product to be scabby.
3. The germs remain in the ground in a vital condition for several years.
4. Potatoes free from scab germs, planted on free ground, will raise a clear product.
5. Tops from affected potatoes, or litter from the potato pits, will carry the germs.

Knowing these facts, the grower will be chary about growing potatoes on the same land without several years of intervening crops. He should be careful to keep the tops in the field that grew the crop, and he should seek to plant seed that is free from the disease.

## GERMS ON SEED MAY BE KILLED.

There is as yet no known way of treating the grown potato to prevent scab, but the germs can be killed on the seed potato, which, when planted on ground free from the germs, must raise a product unmarked by scab. When the cause of the disease was discovered, the different fungicides were tried, to find which was the specific for this disease. Up to the present, corrosive sublimate seems to give the best result, although Bordeaux mixture, in the hands of some experimenters, has made a good showing. From the results of the past two years we have advised the following treatment: For one half of a barrel of water, dissolve two ounces of corrosive sublimate in hot water, using two quarts or more; then dilute to the one half of a barrel. If the potatoes are dirty, wash them, and then immerse them in the solution for one and one half hours. They then may be cut and planted. The time of soaking is immaterial. It may be done weeks before planting, if desirable. The corrosive sublimate solution must be kept in glass, earthen, or wooden vessels, as it will corrode tin or iron.

It is not known how many bushels the one half barrel of the solution will treat. The corrosive sublimate is absorbed by the potato, and in my opinion it will become too weak before the quantity becomes too small for use. This point can be settled in the experiment station by the aid of the chemist.

The poison will act on the germ of the potato, also, but if the solution is made the proper strength and the potatoes immersed the proper time, the germination is affected only by being slightly retarded. By treating and growing many pieces in the college forcing-house, I found that the time of vegetation of the treated pieces, as compared with the untreated was twenty hours later. This was the average of a large number of pieces. In the experiment where the solution was double the normal strength, the seed that was soaked one and one half hours was four and one half days later in vegetating than the untreated seed. In a triple-strength solution, the difference was nine days. In no case did the seed fail, in time, to germinate.

This year the field experiments on potato scab comprise 120 plots, and

consisted of Bordeaux mixture and corrosive sublimate, using different strength and soaking in different lengths of time.

Prof. BOLLY of North Dakota has shown that the yield is increased by treating affected seed. The reason is that the bases of vines are affected, which causes them to weaken and die much sooner than they otherwise would.

In conclusion the assertion can be made that treating seed potatoes and planting on ground free from the germs will give an increased yield and an undiseased product.

#### COMMITTEES—AND A GOOD DINNER.

At conclusion of those reports, President LYON announced the following committees:

On Resolutions—L. R. TAFT, Agricultural college; R. MORRILL, Benton Harbor; J. B. HOUK, Ludington; J. J. GEE, Whitehall.

On Exhibits—S. D. WILLARD, Geneva, N. Y.; L. H. BAILEY, Ithaca, N. Y.; A. S. PACKARD, Covert; Mrs. C. A. SESSIONS, Mears.

Adjournment was made till 1:30 o'clock, when Mr. PRATT announced that Oceana county produced another excellent product, besides fruit, and that was good cooks, as the visitors might know if they would proceed to a certain hall, where those cooks had gathered and were in waiting. The pomologists lost no time in taking the hint, and were soon busy with a banquet of exceeding fine quality, served by the wives and daughters of the hospitable fruitgrowers of Shelby.

Following the paper upon potato rot, came the following one by Prof. L. R. TAFT:

#### THE DISEASES OF FRUITS.

The freedom of all plants from disease depends to a large extent upon the surroundings to which they are exposed. In an unsuitable soil or climate, if they survive at all, they at best will make a weak and feeble growth and are not only subject to disease, but, if attacked, they are very likely to succumb.

Disease may be defined as some derangement of the organs that prevents them from properly performing their functions.

While it is expected that this paper will treat of those diseases that are of a fungous or bacterial nature, brief allusion will not be out of place to other diseases, or other causes, which, although non-parasitic of themselves, frequently produce or promote the development of fungi and bacteria.

#### INCENTIVES TO DISEASE.

Among the first of these may be mentioned the injurious effect of wet soils. All fruitgrowers understand that few of our fruits will thrive when placed in low spots where water stands after a rain, or where they will have wet feet; but it is not so well known that trees growing in depres-

sions, well drained though they be, are more subject to fungous diseases than those upon adjoining knolls. As exceptions to this rule we must note the plants which naturally grow in moist soils, and all such as are subject to the powdery mildews, the development of which is induced in hot, dry summers upon the high land. While other causes may act, it is likely that the dew deposited upon the foliage, being heavier in the depression than upon the elevation, though but a few rods apart, is the principal cause of the difference.

The amount and character of the plant food supplied to plants has of course much to do with their growth, and, as noted above, this modifies to a considerable extent their susceptibility to the attack of fungi. The injury is caused by the entrance into the tissue of the plants of the roots (hyphæ) of the fungi, and if the plants are uninjured, and have made a normal growth, the difficulty of gaining an entrance into the interior will be enhanced. Plants growing in a rich, moist soil, containing large amounts of organic matter, particularly stable manure, are likely to make a loose, watery growth through which the germ tubes can readily gain entrance. On the other hand, the use of fertilizers deficient in nitrogen, but rich in potash and phosphoric acid, will promote a firm growth that will not only be less subject to the attack of fungous diseases, but will be less injured by unfavorable soil or climatic conditions. By the proper use of these fertilizers (ground bone, wood ashes, and potash salts), there is also a decided improvement in the flavor and color of the fruit.

#### OPERATION OF FUNGI AND BACTERIA.

With every precaution in caring for our fruits, destructive fungi often gain admittance, and battle must be waged against them.

While the number of diseases caused by fungi is legion, the number of bacterial diseases that are known to act as parasites is comparatively small. If in any way the microbes (seeds) of these diseases gain entrance to the interior of the plants, they spread from cell to cell, causing a sort of fermentation and destruction of the tissues. These microbes are very minute, requiring the highest power of the microscope to reveal their presence. The affected portions turn brown and the plant has much the appearance of being sunburned.

In the case of fungi, however, it is often possible with the unaided eye to make out the nature of the disease, as each has its own specific appearance and at some time of their development they form upon or just beneath the surface clusters of seeds known as spores. These may be arranged, one upon the other, in chains, or in groups upon the extremities of long, slender stems, giving the leaves or stems a powdery or, at other times, a velvety appearance.

When the specific appearance of either fungi or bacteria can be made out with the microscope, the botanist has no difficulty in determining which is causing the disease and what species it is. A person familiar with the appearance of the different diseases can also often do this without the aid of a microscope. While no general rule can be given which will apply in all cases, it may be said that if any portion of a plant takes on a velvety, downy, or powdery appearance, or shows brown spots in which black dots appear, the disease is due to a fungus. On the other hand, if the leaves turn brown without apparent cause, with none of the above indications, it is very likely due to a bacterial disease.

## TWO CLASSES OF FUNGI.

The fungi of our fruits, as is the case with all other forms, may, for our present purpose, be divided into two classes—(1) those that remain for the most part outside the tissues of the plants, and (2) those that are developed within them. These fungi, like other plants, form spores in one or more ways, that act as seeds to perpetuate the species. So soon as they develop they are likely to be moved about in some way, generally by the wind, and if they fall upon plants of the proper kind they will germinate, provided a sufficient amount of moisture is present. As for seeds, the presence of moisture is necessary for germination, and this explains, in part at least, why the various fungous diseases are, as a rule, more injurious in wet than in dry seasons.

After germinating, the threads of the fungus find access to the interior of the plant, penetrating the cells and absorbing the contents. As a result, the cells shrivel and dry up, giving the portion of the plant involved a brown appearance. After a time the fungus develops spores, generally in great numbers, by which it is propagated and distributed.

In a general way, it will be seen that there is a very close analogy between the life history of the fungi and that of the higher plants.

## INJURY NOT CONFINED TO ONE SEASON.

The injury from fungi is several fold, and is by no means confined to the portion of the plant attacked. The stems, leaves, and fruits upon which it appears, are, in severe cases, destroyed outright. The fungus taking up the food designed for other parts of the plant, may thus affect quite distant portions by destroying the leaves. The power of the plant upon which it is feeding, of developing food, is greatly decreased and its growth is thus checked.

It will thus be seen that the damage is greater than appears at first sight, as not only is the portion where the fungus shows destroyed, but, from one or both of the other causes, growth in other parts of the plant may be nearly or quite prevented.

## HOW FUNGI MAY BE DESTROYED.

It has been found by experiment that the seeds (spores) of fungi, if brought into contact with certain materials, are unable to develop, and upon this fact the spraying of plants with fungicides depends. While various chemicals have a good effect, there has been nothing found which equals copper sulphate; and the preparation known as Bordeaux mixture is for most purposes preferred to all others. The only objection to it is that it forms a sort of whitewash over the plants, and it is not well to apply it to portions of plants which are to be eaten, within four weeks from the time they are to be used. If properly applied it will disappear by that time and no injurious effects will be produced.

From the fact that most of the fungi live in the interior of other plants, they are beyond the reach of any treatment after they have obtained a foothold, and our only hope is in preventives. It can readily be seen, from what has been said, that, if the entire surface of a plant can be kept covered with some fungicide during the growing season, the spores which

fall upon it will be destroyed, and thus the plant will be kept healthy. This is what we should attempt to do when spraying with fungicides, and the nearer we approach it the greater will be our success in keeping off diseases from our plants.

From the fact that the so-called powdery mildews of the grape, gooseberry, rose, etc., live upon the surface of the plants, they are quite easily destroyed at any time; but for the most part little can be done after the fungi have affected a lodgment except to prevent further spread of the disease.

The work with fungicides, by the experiment stations, has been along three principal lines: (1) What fungicides are most efficient, and in what strength should they be used? (2) When should they be applied? (3) For what diseases are they specific?

As has been stated, Bordeaux mixture is now regarded as one of the best, not only as being one of the most efficient but because it does not burn the foliage, permits the addition of Paris green, thus forming a combined insecticide and fungicide, and is withal a cheap remedy.

#### PREPARATION OF FUNGICIDES.

The formula and method of preparation have many times been given, but it should be noted that the strength has been considerably reduced, as while some prefer to use so much as four pounds of copper sulphate and three pounds of lime, to thirty-two gallons of water, particularly for the first application, half that strength (four pounds of copper sulphate, three pounds of lime, and sixty-four gallons of water) will give fully as good results, particularly after the first application.

For use late in the season when there is danger of the lime coating the fruit, modified *eau celesté* (2 pounds of copper sulphate, 2 pounds of soda carbonate, 1 quart strong ammonia water, and 32 gallons of water); or ammoniacal solution of copper carbonate (3 ounces copper carbonate, 3 pints strong ammonia water, and 32 gallons of water) are preferable. but one application is all that will be desirable.

To secure the best results, the application should be made early in the season, as one spraying before the leaves appear is worth a half dozen after the fruit is half grown. For most fruits, an application early in the spring, before the buds swell (it may be done in the fall if there is more time), is desirable. The stems and branches are at that time more or less covered with the spores, and, as the foliage is off, they can be readily reached, and a small amount of material will suffice to destroy them. If the disease is likely to become troublesome, it is a good plan to make a second application just before the fruit buds open, and to repeat it within a week after the blossoms fall, although these last two may be combined in one application, to be made as soon as the trees are out of bloom. As a rule not more than five applications need be made to ward off the disease (the last ones at intervals of two or three weeks), and in favorable seasons two or three are all that will be profitable with most crops, while very marked effects can be produced with one.

#### WHAT FUNGICIDES WILL DO.

In a general way we may say that by the thorough use of fungicides, nearly all the diseases of our fruits may be kept in check. Recent exper-

iments would seem to demonstrate that the curl of the peach leaf may be almost entirely prevented, although the cold, wet weather in which this disease is most troublesome, is not favorable for the use of fungicides.

The brown rot, which not only destroys our peaches, plums, and cherries, but is often quite injurious to the leaves and branches of the trees, can with care be kept in check; although for the same reason it, like the peach leaf curl, is a difficult disease to control. To secure the best results, the diseased fruits should be buried, and after giving the ground a thorough wetting down at the time of the first application, work it with some sort of drag or cultivator, to bury as many as possible of the spores. By thinning the fruits so they will not touch each other, the rot can also be greatly reduced, and this should at any rate be done to increase the size of the remaining fruits.

While the use of fungicides will lessen the chances of the spread of black-knot, it should not be relied upon in fighting this insidious disease. As soon as a knot appears it should be cut off and burned. If this is done as early as May of the first season, before the greenish, velvety coat forms, it will ripen no spores; while if left until the following April, two crops at least will have been scattered. When upon the trunk of a tree, when serious harm would be done by the cutting off of the knot, it can be pared off, and, by treating the wound with tincture of iodine, the knot will be destroyed.

The fungicides may also be used for the strawberry leaf blight, which is often so destructive to our best varieties. The application of Bordeaux mixture to the plants in August, and again as soon as the blossoms have fallen in spring, will render free from disease varieties that are very subject to it.

The scab of the apple and pear, and the leaf blights of the pear, quince, and plum, can be readily controlled by spraying; but, as for the other diseases, to be entirely successful the applications must be made at the proper time. During the past winter, thousands of young plum trees died because the wood was in an unripe condition, from the fact that the trees dropped their leaves in July or August. Had they been sprayed, even once, when the disease first appeared, they would have retained enough of their leaves to go into winter quarters in good condition.

While the loss of the apple crop in 1892 was in part due to climatic conditions and other diseases (some of them, probably, bacterial), the apple scab fungus appeared upon the foliage, and, where it was not severe enough to cause the leaves to drop, it destroyed more or less of the tissue and greatly reduced the growth of the trees.

The grape was one of the first fruits upon which fungicides were used, and the more successful growers use the spraying pump as freely as the cultivator. From localities where, without its use, grapes could not be grown, some of the finest fruit upon the New York market is shipped.

As with the disease mentioned above, so with nearly all others. If spraying is undertaken in time, and is properly kept up, they can be held in subjection and their terrors will be lost.

#### THE WHOLE MATTER DISCUSSED.

It is not safe, Prof. TAFT said, to use the arsenites or Bordeaux mixture upon ripening fruits. The several strengths of the Bordeaux mixture for

successive sprayings, should be four, three, and two pounds of copper sulphate, with lime in proportion. These will be as effectual as though the strongest solution were used continuously, while the expense is decreased and the work is more easily done.

Mr. C. F. HALE: Have there not been several different formulæ given out at different times? And is there any danger of getting it too strong?

Prof. TAFT: No; none of them are too strong, but weaker ones are as well later in the season. I would advise two sprayings before the leaves appear, and, on the peach, two after the petals drop. One of these sprayings may be done in the fall or very early spring. I would spray twice yet this season, or oftener if rains are excessive. The spraying must be done before the rot of the fruit appears, and so as to all other fungi, for it is a preventive to germination of the spores, not a cure after the spores have grown and entered the leaves or fruit and are beyond the reach of any remedy.

Mr. MORRILL: I find that in four or five cases, here, men have sprayed peach trees with Bordeaux mixture, and the effect, in decrease of curl-leaf, is plain to be seen.

Prof. TAFT: The spray will not stop the curl in any one leaf, but will prevent spread of the fungus to others.

Someone asked Prof. BAILEY what nozzle he preferred, and he said the McGowen, made at Forest Home, N. Y., and he went on to say: You have no idea of the extent and thoroughness with which spraying is carried on in New York, where it is the sole reliance for crops of fruit of all kinds. Spraying is done four, five, six, even ten times per season. Its value is various, and is not confined to the crop of the first year, but helps preserve that of the next, by the increased vigor it gives the trees. He cited the case of an extensive grape-grower in the Cayuga lake region, who declared that if rot attacked his grapes he would cut them out, for he could have no margin of profit if the annual expenses were in any way increased. But Mr. BAILEY told him he would find himself spraying, and he did; and found also that he was making more money than before, so much was the crop increased.

Mr. MORRILL: I have seen enough damage done by curl-leaf this morning to pay for spraying all the orchards within five miles.

Prof. TAFT: Use of Paris green in the Bordeaux mixture will not hurt any sort of foliage before the first of July, and it pays to do so; but the arsenic should not be used within four weeks of picking.

Mr. A. ADAMS of Shelby: A peculiar spot was noticed on some of my peaches last year. At first it was creamy white, turning to reddish brown, like freckles, and growing to the size of a dime. It did not seem to affect

either the size or flavor of the fruit, and was not raised above the surface; but it made the fruit unmarketable. I stopped the spread of it on some varieties by the use of Bordeaux spray.

Prof. BAILEY said it had been noticed upon peaches and apricots in New York, and was a new thing, but could, doubtless, be prevented by the measure Mr. ADAMS had taken.

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### *Wednesday Afternoon Session.*

The second session of the meeting was devoted to topics germane to peach culture, and was largely attended and thoroughly enjoyed. The subject was introduced by the following papers, the secretary reading the one provided by Mr. TAYLOR, his attendance being impossible:

#### PEACH YELLOWS—THE OUTLOOK.

This is not an attractive subject. We treat it as a duty, not as a pleasure. It recalls memories of blighted hopes and disappointments; but even these are not to be despised if they are turned to good account.

To this end various questions come to mind for solution as we contemplate the origin of the disease and the progress that has been made in eradicating it before it eradicates the fortunes of those who are interested in the growing of such a desirable fruit.

It might not help us to a remedy for peach yellows to know whose orchard produced the first tree affected by it, or whether the proprietor propagated from it as a new and choice variety, and sold the trees at a fancy price and the fruit for its beauty and flavor; but it would be a source of satisfaction to know the conditions, circumstances, soil, and surroundings of the tree which developed the first germs of such an insidious enemy to our choicest peach belts.

#### HOW DID IT ORIGINATE?

Was there a malaria peculiar to peach-growing districts, generated by exhalations from decaying leaves and wood? Did the growing trees exhaust the vitalizing elements of the atmosphere essential to peach perfection in wood and fruit? Who can tell? Causes often open the way to cures. If we knew the former we might successfully strive for the latter. The invisible germs of disease are often more to be feared than disease itself. Is this disease, peach yellows, of long duration? Have great efforts been made to eradicate it? How long did it blight the growing tree and destroy the ripening fruit before it was recognized as an enemy to the peach industry?

## WHERE THE DISEASE FIRST APPEARED.

Ninety years ago, or about the beginning of the present century, it prevailed sufficiently to attract attention. How long before this it had been making inroads upon peach groves, no one seems to have written nor recollected. When it first appeared there were no great interests at stake, and hence no counteracting efforts to its progress. About the year 1800 this disease made such inroads upon the peach groves near Philadelphia, in the states of Pennsylvania and Delaware, as to cause anxiety and alarm. From this locality it found its way into the states of New Jersey, New York, and Connecticut wherever peach trees were planted in any considerable number.

As peach-growing was not at that time a specialty in any part of the country, very little is found on record to show how extensively the disease prevailed or how fatally it did its work. In fact, we can not be sure that commercial peach-growing had much to do with the pomology of that time. A few trees, here and there, for domestic use was the prevailing method of cultivation. As facilities for transportation of perishable fruits long distances were not at hand, only those who lived within easy reach of great cities grew peaches for market.

Under such conditions, a disease like yellows could do its work without exciting any special interest in the public mind; and it seems quite probable that this insidious disease crept slowly along into the clumps of trees which adorned the yards and gardens for years before it became a subject of historical observation. And there is no evidence that our country has been entirely free from peach yellows from the time it first appeared, even many years before a record was made of its existence. Some seasons seem to have been much more prolific of disease germs than others, so that the industry waxed and waned according to the prevalence of the mysterious cause of destruction.

## NOTES OF ITS PROGRESS.

We can not better describe its characteristic progress than by speaking of it as both epidemic and contagious. It may be regarded as contagious. With this element ever present in its nature we can readily see how it lives from year to year without attracting much attention. The few old trees which may be found in by-places and neglected gardens hold the germs in readiness for dissemination at the first favorable opportunity. Like small-pox or whooping-cough in the human family, peach yellows has its hiding-places, and because these are not searched out and renovated the disease germs are rendered active by climatic and physical conditions to which we are strangers, and then comes the epidemic.

These epidemic periods seem to have come around in 1800, 1830, and about 1868, and now, in 1892, the fourth climax has been reached. We shall be disappointed if it does not wane again during 1893-94.

## FIRST ATTEMPT IN CHECKING YELLOWS.

In 1875 the first attempt at systematic sanitary measures to check its progress was made in Allegan, Ottawa, and Van Buren counties, Michigan. This was a small beginning, and was poorly executed, but where would the peach industry be today if this beginning had not been made?

And where might it not have been if each and every grower had been faithful to the letter and spirit of the law? You may call these imaginary questions, but among those who have earnestly labored to make the legal remedy effectual, who will say he is not satisfied with the result? Who can wish the work had not been done? And who among the delinquents does not wish he had cut the first tree and every tree as the disease appeared upon his own grounds?

Within a period of ten years or less after peach yellows found its way into Berrien county, the peach industry was entirely wiped out. There may have been a few straggling trees left, but it was difficult to find them. Would not the same be true of the whole peach belt under like treatment?

When we contrast the difference between those sections where sanitary measures were thus early introduced and faithfully carried out and those left in their diseased condition from year to year, or doctored with imaginary remedies and semi-scientific prescriptions, we are satisfied with the result.

During the years 1877, 1878, and 1879, peach yellows raged like an epidemic from South Haven to Saugatuck along the lake shore. There the first battle of opposition to its progress was fought and there substantial progress was made in counteracting its ravages. Since that time the number of diseased trees that have appeared from year to year is very limited.

Other localities, further from the lake, seemed to be more fortunate than now. Wherever thorough work was not done to counteract the progress of peach yellows in 1878 and 1879, it has of late assumed an epidemic form to the great detriment of the peach industry. These facts give us sufficient ground for encouragement for future work.

We do not attribute this decline in the ravages of peach yellows to any advantage gained by contiguity to lake Michigan, unless it be that on our western border no delinquent worker for extermination could leave his diseased trees standing to harbor germs for future dissemination or growth.

We have only attempted to approximate the periods of greatest outbreaks of yellows in general terms, keeping in mind the fact that it does not show its worst features in all parts of the country at the same time. Like a contagious disease in the human family, it may prevail in Maryland one year and in Michigan the next, or vice versa.

The exact dates of greatest destruction, as recorded by Dr. Erwin F. Smith, special agent of the national department of agriculture, run as follows: First recognized appearance of peach yellows in 1791. Then followed the epidemic periods of 1806 and 1807, 1817 to 1821, 1845 to 1858, 1874 to 1878, 1886 to 1888, and 1890 to 1892. As the former periods were followed by comparative immunity, we look for similar results at the present time.

#### HOW REPRESSION IS TO BE ACCOMPLISHED.

But this result can not be looked for without effort. The best sanitary measures must be used. Those who keep up a vigorous warfare upon every tree and influence which can harbor the germs of propagation will soon have an open field for extending their plantations, and less competition in the markets. If they suffer for a while from the negligence

and obtuseness of neighbors, they will soon be rewarded for their vigilance by the diminution of neighboring orchards.

Nature has its methods of compensation. Those who wisely try to help themselves will in due time find help in the laws of a well ordered universe. Men who ignore the laws of health and the sanitary conditions around them will in due time suffer the consequences. Those who carefully guard against disease and comply with the laws of health are often exempt from the scourges of contagion which depopulate cities and villages. This principle seems to be as true in horticulture as it is in society. We recognize only one serious difference: The sanitary laws of society are now well understood. Cleanliness with the proper use of disinfectants, does not often fail to secure the desired results. The sanitary laws of peach tree growth and health are as yet only partially understood. Some things needful to be done are quite evident, while others which should be done are measurably obscure.

#### SOME ESTABLISHED FACTS.

After varied and numerous experiments, Dr. Smith says the following facts have been established:

1. "The disease, yellows, is contagious.
2. "It may be conveyed by seemingly healthful buds when these are taken from diseased trees.
3. "Only a very small amount of infective material is necessary, provided it be in the form of living cells, which can be induced to unite actively with the growing tissue of the tree.
4. "The disease has a longer period of incubation than we have been accustomed to suppose.
5. "The death of the entire tree occurs ordinarily only after several years of infection."

Dr. Smith also concludes that some other hypotheses are highly probable:

1. "The whole tree is affected when symptoms appear in any part of it.
2. "In some cases the time between the insertion of a diseased bud and the appearance of the disease is longer than has been clearly established.
3. "The disease is also communicated to budded trees in some other way than by bud inoculation.
4. "The trees are not infected through the blossoms.
5. "Since the diseased trees have been shown to be very full of infectious matter, it must be that, for unknown reasons, much of this fails to find an immediate entrance into healthy trees."

It is quite evident, then from these facts and hypotheses, that intelligent men can work intelligently toward the production of healthy peach orchards if they will. Living germs of disease are undoubtedly to be found in every part of the growing tree that is infected, and hence destruction is the only remedy. How long these germs can propagate their kind, after a tree is dead has not, as yet, been determined. There is room for further investigation; and while this is going on, every man should be vigilant in removing and destroying every possible source of peach-tree malaria that may be found on his premises. This being done promptly and thoroughly, we believe the outlook for success is highly encouraging.

The following paper was read by Mr. ROLAND MORRILL of Benton Harbor:

## PEACH CULTURE IN MICHIGAN.

Notwithstanding our high latitude and supposed cold climate, Michigan enjoys the reputation of growing peaches as successfully, if not more so, as any other state in the Union. In fact, I believe it is the only state that has not had a complete failure within twenty years. Of course, this applies particularly to the fruit-belt proper, a belt some two hundred miles long on the western shore of lake Michigan, extending inland from ten to twenty-five miles and including the high lands of Allegan, VanBuren, and Kent counties, further inland, besides certain other favored localities scattered over the state. Such a thing as a total failure over all this region has never been known. In view of the fact that the peach crop seems to be entirely reliable over such a large territory in our state, and considering our unequaled markets and shipping facilities, it would seem well that we consider the lessons of the past, discuss the present situation, and study the prospects for the future of this great industry.

First, we will say that, with the possible exception of the apple crop, no other fruit crop is watched with the same eagerness by the great army of consumers, all over the country, as the peach crop. Large crops are hailed with delight everywhere, and short ones with sorrow.

The fact that successful peach culture is restricted to certain sections by climatic influences, and even in those localities is further restricted by certain diseases and insects, furnishes the only reason why it is so profitable.

## WHERE TO PLANT A PEACH ORCHARD.

To be entirely successful, peach orchards should never be planted on low, wet lands, nor on any land that does not have free atmospheric drainage to adjacent lower lands.

Other conditions being right, the peach succeeds on a great variety of soils, from light sand to heavy clay; but the ideal soil is a rich sandy or gravelly loam.

## THE SORT OF MAN FOR A PEACH-GROWER.

After a proper selection of a location and soil, permit me to say a word about who should grow peaches and who should not. Peach-growing is not what it was years ago, when you could set the trees in out-of-the-way places, neglect them, and get plenty of fruit.

The successful grower of today must be intelligent, alert, industrious, and ambitious. Given these qualities and a suitable location anywhere within this peach-belt, and no business pays better dividends today, nor will in the future. But the "crank" who thinks he can cure yellows should not be allowed to set peaches in any neighborhood. There is another class of men who, for their own good, should not embark in the business—that is the confiding men, who always wait for the smooth-tongued traveling tree agent to come along and tell them what to set, finally supplying them with a list of his "World Beaters," "Velvet Cheeks," "None Such," "Iron Clads," and other impossible varieties, shown by beautiful colored plates or by choice specimens of Oldmixon or Crawford in magnifying bottles. I used to think that this class of agents should be landed in state prison,

but have gradually come to the conclusion that they may be of some good after all; for, in these days of horticultural meetings everywhere, with papers and magazines devoted to our interests printed in nearly every state, the man who is duped in this manner really deserves the loss which follows the transaction. Still, the public have a right to complain, as a locality having many of these dupes can not maintain a very good reputation for either fruit or intelligence, as it furnishes a dumping ground for nursery trash that should go to the brush-heap and be burned.

#### AS TO BUYING TREES.

Now, a few words about buying trees. Never buy of irresponsible traveling agents. It is never safe. Do not buy in a locality where people are negligent as to yellows. Buy only of men who have a good reputation and are careful to maintain it. Such men will always give as low prices as they can afford, for cash, and you should not ask them to give you credit, as the thought naturally occurs to them that if your credit is good you would not be looking for it abroad. Always provide yourself with cash, then buy close, never accepting any but choice stock of proper age. The only inducement to a nurseryman to take your note is in case he is overstocked or can work off upon you unsalable varieties or ages. Depend upon it, he will not give you as good a deal as he would for cash.

#### SOME OTHER GOOD POINTS.

Little need be said about fitting land and setting trees, except that, of course, it should by all means be well and deeply plowed and harrowed. It is also important that the trees be procured in the fall and properly heeled in. Then they will be at hand the moment they are desired for setting, which should be as early as the soil will work nicely. Another advantage in fall purchasing is that you can then get whatever varieties you want. They stand shipment better, and generally cost less money. The neglect of these precautions has been the source of many disappointments in peach-growing. Trees should not be set closer than 20x20 feet, or 108 trees per acre, and they should be very firmly set. A few hours' or even days' extra time spent in getting rows perfectly straight and trees properly set will be a source of pride ever after, and is always an attraction if you want to sell a farm.

#### CULTURAL METHODS.

A young orchard should receive thorough culture with some hoed crop (corn preferred) until about August 1, for the first two years, after which it should receive the same culture without any crop. If the location is one in which curl-leaf prevails, it is safer to delay all cultivation until about June 1, or until settled warm weather.

Trimming should be commenced as soon as the growth is fairly started, by rubbing off all growth up to a point about two feet from the ground. Then select three or four strong shoots, evenly distributed about the body for about a foot above this point. From these form your top, trimming out all others. The next spring cut back the strongest growths to correspond with the rest. After this cut back all strong growth each year, fully one

half. Some growers advocate the practice of maintaining a center growth or leader. This is good practice in the south, where protection from the scalding sun is needed; but in this state it is decidedly wrong, in my opinion, as I find that the peach needs all the sun and air it can get to secure a full development and a rich color. The practice of cutting back annual growths I consider of great importance. It causes the development of abundant fruit-spurs all along the limbs, gives hardier buds and more of them, makes the tree stocky and beautiful, able to carry heavy loads of fruit without props or artificial support. It may thicken the growth so that some thinning becomes necessary, but the remaining growth is all the better for that. Of course, a proper thinning of the fruit must be practiced with this system, otherwise the free-bearing varieties would soon be ruined by over-production.

Thinning may be delayed until the peaches are nearly half grown, if you have plenty of help with which to do the work quickly, but by all means get them thinned to four to six inches apart before the pit begins to harden, as the process of seed formation is what draws upon the vitality of the trees. As many bushels of peaches, and many more dollars, can be realized from an orchard thoroughly thinned as from one not thinned; besides, the trees are not exhausted and will bear annual crops, which they will not do if allowed to over-bear.

#### INSECT ENEMIES.

The insect foes of the peach are comparatively few, the only ones requiring much attention being the borer, which attacks the trunks of the trees at the surface of the ground; and the curculio, which stings the fruit. The former can be prevented from doing any damage by the banking of the trees up to the height of a foot, about June 1, and leaving the earth there until about September 1, then hoeing it down and away from the body of the tree, rubbing or scraping the body of the tree clean to dislodge any of the eggs that may have been deposited there. If this plan is carefully followed, it is usually an entire success; but the trees must be watched, and if any borers begin to work on or inside the bark they must be dug out with a sharp knife.

There are several successful methods of fighting the curculio, but I think the plan of jarring them upon sheets is by far the safest and best. There is a trap manufactured, called the wheelbarrow trap, which carries the canvass like an inverted umbrella, with a tin hopper or box underneath, holding about a bushel. With this trap one man can do as much work as four can with the old-fashioned hand sheets, and their cost should not exceed \$20. With one or more of these traps at hand, the cherry, plum, and peach crops are easily saved from the ravages of the "little Turk." When the trees are jarred in this manner, many stung peaches are collected in the box. These should be boiled or roasted in some manner, to insure the destruction of the larvæ, thereby reducing your trouble for the following year.

The only serious diseases which trouble the peach are yellows and curl-leaf. In regard to the former we will say, without entering into any scientific discussion of the matter, that with our present knowledge of the disease I consider its existence a blessing in disguise, for, without it, peaches would be cheaper than potatoes, and entirely profitless. As it is now, the shrewd grower is always on the lookout for the disease and

promptly pulls out and burns any tree which shows any symptoms of the disease, and sets a new tree in its place, while the shiftless, negligent man will not do it, and his orchards fail, leaving him poor in pocket and spirit, while the first named man reaps the financial reward of his enterprise and ability to understand the situation.

Curl-leaf is undoubtedly caused by severe or sudden changes in temperature, following a rapid and successful growth of foliage, and may be prevented in great measure by withholding all cultivation of the soil until settled warm weather. Still, when climatic conditions are right, there will always be curl-leaf, and it is a much more serious matter than many people suppose. But here, again, science comes to our rescue, for at our experiment stations it has been demonstrated that spraying with Bordeaux mixture effectually checks the spread of this trouble, and if begun in season it may prevent it entirely.

#### RECENT IMPROVEMENT IN VARIETIES.

Much has been learned during the last few years about varieties. We have discovered that some varieties resist both yellows and curl-leaf better than others. We have also learned that some varieties will endure a range of temperature of as much as ten degrees lower than the old varieties; and that the best variety for one locality is not always the best for another. Consequently to advise about varieties might be a mistake. The best plan is to plant such varieties as are known to be hardy, early, and prolific; but, while the early varieties (like Amsden, Alexander, Waterloo, etc.) fill this bill, their utter worthlessness in other respects condemn them. Early Rivers and Hale are better and pay very well in our northern counties, but in the southern are hardly worth planting, when compared with such varieties as Lewis, St. John, or Early Michigan, all freestone, hardy, productive, and good.

Among the known good later varieties are Gold Drop, Wager, Stevens' Rareripec, Barnard, Snow's Orange, Smock, and a few others of this class, with Elberta, Kalamazoo, and Conklin as among the very promising new ones. There are other varieties which will soon be offered, which, it is thought, will excel all the older sorts. Let us hope so.

#### HONESTY IN MARKETING.

Line upon line, page after page, has been written upon the advantages of packing and marketing all kinds of fruit honestly, both as regards the package itself and the manner of packing; but a very little observation of our city markets will soon convince any one that a large majority of fruit-growers and packers have never heard of the golden rule, or else think that it does not apply in their case; but experience is a dear school, and the only one in which some fools learn, and the one in which some of our good people are taking expensive lessons annually, and in their blind ignorance ascribing all their failures and woe to other men.

#### GENERAL DISCUSSION OF THE PEACH QUESTION.

MR. HAWLEY to MR. MORRILL: What are the best varieties for profit, and which are the least subject to leaf-curl?

Mr. MORRILL: Absence of tendency to curl is one element of profitability in Lewis, Gold Drop, Snow's Orange, Beers' Smock, and Stevens' Rare-ripe, when of sufficient age. The latter is an improvement on Stump. Three of these are Michigan seedlings, and that may account in part for their successful resistance to influences of our climate.

Mr. WILLARD commended Stevens' Rare-ripe.

Mr. LYON: Some sorts of peach from the south are successful there, like Elberta, and are brought here and set extensively, as though sure to be good. Touch such things lightly at first.

Mr. MORRILL: I have set 1,000 Elberta. I am something of a "plunger" myself, but would not advise others to be so.

Mr. MORRILL commended Brunson's Seedling, as did also Mr. HOUK. Mr. MORRILL said the Kalamazoo is hardy and of excellent quality. He also assured enquirers of the safety of resetting peach trees where such trees have been removed because of yellows. He had known this to be practiced with safety in many localities.

Some one asked as to the Jacques.

Mr. MORRILL: It is variable in character, and the tree is weak. Mr. LYON: It has for these and other reasons been dropped from the American society's list.

In answer to inquiries from men who had never seen yellows, Professor TAFT described the disease in all its characteristics. The disease has been seen in nursery stock one year old, yet infected buds set into young stocks are not likely to grow; nor will infected pits grow at all unless from trees very slightly affected.

Mr. LYON: We need have no fear of the spread of yellows from pits. I once planted all the pits from an almond tree, and scarcely any grew. The tree had yellows the next season. Mr. GULLEY of South Haven once collected a lot of yellows pits to send to Lansing for experimentation; but, cracking a few and finding no germ, the whole were cracked and not a single pit of them all had a germ in it, and so could not possibly have grown.

A member said he had heard much of how yellows does not spread, and would like to hear just how it does go.

Mr. LYON: The theory is that, because of its appearance in remote places, it spreads, not so much by contagion as by infection. It may spread by diffusion of pollen; and bruising of infected trees against others is pretty sure to cause them to have the disease. But these are theories. We are by no means certain of the method of diffusion of the disease.

Mr. H. H. KEYS of Belmont: In the vicinity of Grand Rapids, last

year, 1,000 to 2,000 trees were removed because infected with yellows; some were burned and some were dragged out. Which is the better way?

Mr. MORRILL: Take some dry fuel to the orchard; cut up the diseased tree, even below the surface, and burn it right there. But little trouble will be had in doing this thoroughly, and it is the only certain way to prevent spread of disease from the cut tree. On no account should it be drawn through the orchard.

Mr. MEISENHEIMER of Ludington: Is there any yellows in Oceana county?

Mr. A. ADAMS of Shelby: No tree has ever been seen or known certainly to have the disease. In two or three cases, trees which did not look just right have been taken out, but it is not known that their malady was yellows. It is not believed to have been.

Nevertheless, Mr. MORRILL told of a Benton Harbor packer who bought a carload of peaches in Oceana county, and some of the fruit certainly had yellows. Oceana county men, however, would not admit that this was even possible. "Did not that car pass through Fennville on its way?" humorously asked one of Oceana's champions.

Mr. GARVER of Hart asked what was the condition of a tree that made it likely to produce yellows within itself; but to his puzzling query there was no answer.

Mr. PACKARD of Covert: The Oceana men do not seem to know what yellows is when they see it. They would better get some one who does know it by sight and have him go through their orchards. "If you are clear of the disease you are fortunate. Keep clear."

Mr. MORRILL having remarked that yellows should not be feared, because it is really a benefit, keeping the careless and indifferent out of the business of peach-growing, and so preventing over-production, Mr. LYON said he objected to that idea. Arrangements for transportation and consumption are not so well provided as they would be if there were a greater production of fruit. Yellows is an insidious enemy, and we would much better be without it.

Mr. PACKARD spoke briefly about packages and packing. In his own house he insists upon honest packing in every respect. The average commission merchant is as honest as the average fruitgrower. [Applause.]

Mr. MEISENHEIMER: I make three grades, and I get nearly as much for seconds as firsts, and probably because of their uniformity.

Prof. BAILEY: Nearly all these difficulties which have been spoken of are educational, and the greater they are the better the fruitgrowers. I have had experience among the fruitgrowers about South Haven, and

again among those of the east, who are much more shiftless in their methods than are you Michigan men; and it is apparent that improved methods come in where yellows is most prevalent.

Mr. MORRILL: That is just my idea of it. Have yellows and fight it and you will succeed.

The desirability of the Susquehanna peach was spoken of. Those who had grown it in Oceana county said very few had been produced, but those were of very fine quality.

Mr. PACKARD: It bore with me better than any other variety last year.

Mr. FARNSWORTH: They bud and bloom, but the least cold weather causes the blossoms to drop. The buds are perfectly hardy.

Mr. ADAMS and Mr. HALE said that the peach orchards which have had the earliest and best cultivation now are showing the least curl-leaf; they had cultivated early in order to avoid it.

Mr. MORRILL advised against too much early cultivation, so as to avoid having so much tender growth exposed to cold winds.

Mr. MEISENHEIMER: My earliest cultivated orchard has three times as much curl-leaf as the one cultivated later.

Mr. FARNSWORTH: Curl-leaf is caused by sudden changes in May, when the winds are from the east and northeast. Orchards sheltered from such winds have little of the disease, while those exposed have much of it.

Mr. MARKHAM: Cultivation has little to do with it; it's the weather. Some seasons we have very little of it, some seasons much. I cultivate early, to get the work out of the way, and shall continue to do so.

Mr. HAIGHT: It seems to be worked out to a demonstration that we don't know what the cause of this disease is.

Prof. TAFT: But little is really known. In May or June comes a check to the growth of the leaves, and a fungus develops. Probably cold and wet weather is the cause of this. Spraying with Bordeaux mixture, early, before the leaves appear, and again before and after the blossoming, will greatly reduce but not wholly remove the disease. It would be entirely effectual but that the cold rains wash away the fungicide.

Mr. H. H. PRATT said he had used this method on a few trees, as a matter of experiment, and with success.

*Wednesday Evening Session.*

## SEX IN FRUITS.

This most important subject was opened by Prof. L. H. BAILEY of Cornell university, in the paper which is subjoined in full. He prefaced the paper with remarks upon use of sex in nature, which is to vary and revitalize races, both of men, animals, and plants. This also is the office of flowers, which, more than subdivision or offshoots of individual plants, produce variation of the product and consequent adaptability to new environments.

Since the demonstration of the value of sprays for exterminating the insect and fungous enemies of fruits, the most important advance in American pomology is the discovery that some varieties of fruit are unable to fertilize themselves. Much of the failure of apples and pears and native plums to set fruit, even when bloom is abundant, is unquestionably due to too continuous or extensive planting of individual varieties; and it is safe to expect that other fruits are also jeopardized by unmixed planting. This knowledge, as soon as it becomes more extensive and exact, is sure to modify greatly the planting of orchards. But there is also an important philosophical side to the problem which I wish to suggest at this time. Why are varieties infertile with themselves? What relation does such infertility bear to the evolution of varieties? Is it likely to increase or diminish in future varieties?

## FIRST APPEARANCE OF SEX.

When sex first appeared, the individual was hermaphrodite, that is, the two sexes were present in the same organism. The two sexes are opposed to each other in their physiological evolution, however, the female sex-elements being developed from the constructive or vegetative (anabolic) changes within the organism and the male sex-elements from the destructive or dissociative (katabolic) changes. It is impossible, especially in organisms of increasing complexity, that these opposed changes of the organic structure can take place simultaneously, at least in equal degree; and it therefore happens that even in the lowest hermaphrodite or bisexual organisms the sexes develop or operate alternately, the individual being at one time essentially male and at another time essentially female. In this way it first came, no doubt, that self-fertilization was more or less prohibited. Now, as the struggle for existence increased, every organism, whether animal or plant, was obliged to dispense with every superfluous ambition and to concentrate its powers upon those organs and functions which were an absolute necessity to the prolongation of the life of the species. There came a tendency in certain individuals to eliminate one sex and in other individuals to eliminate the other sex; so in time there came to be male and female, or a division of labor. But other advantages besides a mere division of labor resulted from this disjunctive evolution. The male and female individuals became unlike in other features than those of mere sex,

and the offspring of their union were more variable than those which might spring from one parent, or which had no father and mother. The more variable the offspring of any species, the greater are the chances that many of them will find congenial or at least tolerable places in nature, and the safer is the species in the contest for life. It is the opinion of some modern philosophers—Weismann and his followers—that the entire use of sex is to originate variation in the offspring.

#### NATURE'S TENDENCY AS TO SEX.

There must be a general tendency in species toward unisexuality. All the higher animals are male or female, and some of the plants are so, also. The great majority of plants, however, are still hermaphrodite. All our common fruits have what the botanists call perfect flowers, that is, those which contain both male and female organs. Yet nearly all hermaphrodite plants develop their male and female parts at different times, so that the flower can not fertilize itself. This, we suppose, is in consequence of the fundamental law that the constructive and destructive changes upon which the female and male elements respectively rest—or anabolism and kalabolism—can not proceed simultaneously. In most plants, self-fertilization is prohibited or hindered by this simplest of all methods, the different or alternate maturing of the sexual organs. But the plant often goes further than this, and the pistil or female organ refuses to accept the pollen from the same flower, or even from any flower on the same plant; or, to transpose the statement, the pollen is impotent upon its own sisterhood of pistils. It is difficult to account for the physiological origin of this impotency, although we should expect that male organs which are prevented from fertilizing associated pistils might in time develop pollen which would be incapable of fertilizing them; but its use to the species is obvious, inasmuch as it insures cross-fertilization and thereby tends to strengthen or revitalize the species. Darwin was among the first to study this subject, and he published a list of plants which are sterile with their own pollen; but none of the fruits are in his list.

#### DEVELOPMENT OF SEX IN PLANTS HAS BEEN SLOW.

This fact—the impotency of certain plants with themselves—is itself of immense practical importance, but we are anxious to know if such characters are likely to increase among cultivated plants, and if the future holds more perplexity than the present. We have found that as struggle for existence increased and organisms became more complex, animals could not afford to be hermaphrodite or bisexual, for all the surplus energy was needed for the development of a single sex. Among plants, this separation of the sexes has proceeded more slowly because of their exceedingly constructive or vegetative character, which supplies sufficient nutriment to maintain both sexes in greater or less perfection. But the further we develop fruits the greater is the energy required in the production of that fruit, and the greater, it would seem, must be the tendency toward the suppression of one sex in given individuals, or toward the evolution of unisexual individuals. Now, it is highly probable that one of the first steps in the separation of the sexes is a differentiation in their mutual relationships, whether a difference in time of maturing of the sex-elements or in the com-

parative intimacy with which they react upon each other. If these speculations are well founded, it leads us to the conclusion that this impotency among cultivated plants is the beginning of unisexuality, and that such impotency is likely to increase with the greater amelioration of the species. Inasmuch as the female sex-elements are the result of constructive or vegetative changes, it would seem to follow that such elements would be most likely to be retained in the great vigorousness of cultivated plants, and that the pollen would first show signs of failing. And this is well illustrated in many cultivated species, for deficiency of pollen is by no means uncommon, while good pistils are almost always present. The only important exceptions to this statement are the double and sterile flowers, like the roses, carnations, and snowballs; but these plants have been bred directly for their doubleness or sterility, and do not, therefore, influence the present inquiry. The berry-grower knows that all strawberries have pistils or female parts, while an increasing number have no pollen. Potatoes now fail to set bolls because the anthers are deficient in pollen, and horseradish does not set seed, probably for the same reason. One who undertakes to perform experiments in the crossing of cultivated plants, soon finds that it is more difficult, as a rule, to obtain good pollen than good pistils.

#### IMPROVEMENT OF FRUITS INCREASES DEMAND UPON THE TREES.

An excellent proof that increased amelioration of fruits imposes a severe tax upon the energies of the plant, is afforded by the habitual failure of very many or even the greater part of the flowers upon a fruit tree in full bloom. Apple flowers are borne in clusters of from five to ten, and yet, except in the crabs, apples are usually borne singly, that is, most of the flowers fail. And trees which bloom full rarely average even one fruit to the cluster. Small wild apples are frequently borne in clusters, and there is every reason to believe that originally all the flowers normally set fruit. With the enormous development in size and other qualities of fruits, the plant is unable to use all its flowers. I am inclined to think, however, that these extra flowers serve a very useful purpose in supplying pollen to those which chance to set, for not only is the supply of pollen in the individual flowers probably becoming less with the improvement of the apple, but it is also probable that more is needed to incite the enormous increase in size over that of the inferior aboriginal apple. What is true of the apple is true in various degrees of all orchard fruits, even of the cherry; and it is most graphically shown in the tomato. It is here worthy of remark, also, that probably the chief reason why the bush fruits, as blackberries, raspberries, and currants, do not more rapidly improve in size is because all the flowers upon the clusters still set fruit. All these instances show that cultivation or improvement seriously interferes with the mutual relationship of the sexes, and this disturbance or unbalance is likely to increase rather than diminish.

#### A STILL FURTHER ADVANCE—VARIETIES MAY BE SELF-STERILE.

But it now transpires that not only are some plants impotent or infertile with themselves, but in some cases all the plants of a given variety are infertile among themselves. Thus it has long been known that the Wild Goose plum is usually unproductive when planted in isolated or unmixed

blocks, and the same is true in various degrees of most varieties of native plum. Of the pears which have so far been studied in this connection, the self-sterile are Bartlett, Anjou, Clapp Favorite, Clairgeau, Sheldon, Lawrence, Mount Vernon, Gansel Bergamotte, Superfin, Pound, Howell, Boussock, Louise Bonne de Jersey, Souvenir du Congress, Columbia, Winter Nelis, Bosc, Jones' Seedling, Easter, and Gray Doyenne. Those which appear to be self-fertile are White Doyenne, Le Conte, Kieffer, Duchess, Seckel, Buffum, Manning Elizabeth, Flemish Beauty, and Tyson. Among the apples the following are found to be self-sterile: Talman Sweet, Spitzenburgh, Northern Spy, Chenango Strawberry, Bellflower, King, Astrachan, Gravenstein, Rambo, Roxbury Russet, Norton Melon, and Primate; while Codlin (partially), Baldwin, and Greening are self-fertile. These are results obtained by M. B. Waite, who has brought this investigation to the fore.

At first thought this fact, that varieties may be self-sterile, looks strange, but it is after all what we should expect, because any variety of tree fruits, being propagated by buds, is really but a multiplication of one original plant, and all the trees which spring from this original are expected to reproduce its characters. If this original tree was self-sterile, therefore, we should expect all trees propagated from it to be equally so, in just the same way that we expect all plants of the Haverland strawberry to be pistillate, like the original parent. To say that any variety of fruit is impotent with itself, therefore, is really the same as saying that the original seedling parent was impotent with itself; and the fact that some varieties are impotent while others are not is proof that fruits vary or differ in this respect when grown from seeds. Perhaps there are as few impotent fruit trees now as there ever were, and that our attention is now called to them simply because they have been propagated or multiplied extensively, and because we are now inquiring carefully into all horticultural problems; but I am inclined to think, from reasons already advanced, that there must be a general tendency toward self-sterility. The natural check to this self-sterility is the raising of plants from seeds, by which means a considerable amount of variation is secured in sexual characters. In proof of this, I will cite the case of garden vegetables, in which the various individuals of a variety are fertile with each other, even when a given individual is sterile with itself. Thus blocks of the same variety of tomato or bean fertilize freely. But while this same intra-varietal fertility would undoubtedly result from growing only from unbudded or ungrafted fruit trees, the disadvantage, as every one knows, would be so great as to make the practice unprofitable. But the same result can be obtained by planting different named varieties together, for these varieties represent different seed parents. And this is the conclusion which the best practice enforces, for mixed orchards are, as a rule, the most successful ones.

#### SUMMARY.

A broad epitome of the whole problem seems to run something like this: There is a general tendency in nature toward a separation of the sexes, or unisexuality, and tendency is probably hastened among plants by high cultivation. The first signs of separation, and beyond which most plants may never go, are differences in the time of maturity of the sex elements and the failure of pollen to impregnate several flowers. Subsequent steps are the failure of many normal flowers to set fruit and diminution of the

pollen supply. The extensive multiplication or division of impotent or self-sterile individuals, and the setting of the resulting plants in large blocks, have given us unfruitful orchards. If increasing amelioration tends toward a sexual unbalance, it must follow that unfruitful orchards are likely to increase unless intelligent mixed planting is brought to the rescue.

#### POINTS DEVELOPED BY DISCUSSION.

MR. WILLARD: On James river, Virginia, were set 22,000 Bartlett pears in a single block. This was after the war of the rebellion. Before that time, in the same locality, an orchard of several hundred trees, including one hundred Bartletts, had been wonderfully productive, yielding so much as \$10 per tree. Twenty-five years ago the big orchard was set, and it has usually been a failure, producing only a few good crops. This well illustrates the truth of Prof. BAILEY's position.

MR. LYON: Are we to infer that Hill's Chili, and other varieties which reproduce from the pit, are self-fertilizing?

Prof. BAILEY: Undoubtedly, but which is cause and which effect is hard to say.

Prof. TAFT: Some old Roman writer tells us that there were found certain varieties of fig which were not self-fertilizers, and they were grafted into others, or blooming branches of other sorts were hung in the limbs of these, and fertilization so accomplished.

MR. LYON: There are a few cases wherein fruits, grapes more particularly, have produced seedless fruits; and it is an interesting question why this is so. In 1889, a yard of Wyoming Red grapes in western New York, had such fruits, and investigation led me to attribute it to non-fertilization. Some plants do regularly set fruits which are seedless, Zante currants, for instance; and tomatoes and forcing cucumbers have been often produced which were solid and seedless.

Prof. BAILEY exhibited a strawberry plant and blossoms, and said that "button" berries or knotty ones are caused by non-fertilization. One-sided apples may also be attributed to this cause. He did not think that pollination of the strawberry changes either the size or quality; still, he might be wrong about this, for but little is as yet demonstrated. He would not plant more than two rows of self-sterile strawberries together. The orchards of ELLWANGER & BARRY, and those of Mr. WILLARD, are all mixed up, as to varieties, and are regularly fruitful on this account. The peach seems less liable to failure from this cause, than most other fruits; still, there may be something in the idea, even as to the peach.

## A GRIST OF QUESTIONS.

*What will prevent the ravages of the striped beetle and the black stinking squash bug (Anasa tristis)?*

Mr. WOODWORTH told that he once read of a man who said he put coal tar around the vines, spread upon worthless paper, and for this purpose he used agricultural reports!

Mr. HAIGHT: Kerosene oil in plaster, sprinkled among the vines is quite effectual.

Prof. TAFT: That is good, but turpentine is better. To catch the black bugs (that is the only way to deal with them) place shingles around among the vines, and they will hide under them and be easily caught.

A member said hen manure water is sure to drive off the striped bug.

Mr. JOHNSON: Whale oil soap suds will drive these bugs away.

Mr. MORRILL: I use slaked lime and sulphur to drive off the striped bug; but killing is the only thing to do with the black fellow.

*Is there any objection to high manuring of the blackberry, or entirely mulching the ground with stable manure, except that it might cause a later and more tender growth of wood?*

Mr. MORRILL: There is no objection, except as to the expense; indeed, I prefer high manuring for the blackberry. Heavy mulching might make a later and tender growth, but we lay the canes down, anyhow, for the winter, and as to this make no difference as to varieties.

*Is the gum about the root of the peach tree always an indication of the borer, or are there other causes for it?*

Mr. HAWLEY: It is caused by any abrasion of the bark, as well as by the borer.

*Is sowing and plowing under winter rye good for peach and plum orchards?*

Mr. WILLARD: The action of rye upon the soil is mechanical mainly, but is good in that way. But as for a fertilizer, clover would be better, for it draws elements of fertility from both the air and the depths of the soil.

Prof. BAILEY: The question has been much discussed. Rye is better than nothing upon the ground over winter, especially upon light soils. Rye has a little value as a fertilizer, and so has buckwheat, but neither is of much value save as a cover for the soil. I would use some leguminous plant instead (such as peas or the vetches), but it is questionable if it is well to place clover in a young orchard. There should be some cover to the soil during fall and winter.

MR. WILLARD: We do put clover into our orchards when young, and turn it under the first season, when well in bloom, but this is not to be done on these light soils.

MR. RUSSELL: We might as well throw away the seed as to try that here—we would get no catch.

MR. MORRILL: It is easy to get a catch by sowing wood ashes first. I use mammoth clover for this purpose in preparing land for trees.

Prof. BAILEY: We have used beans as a cover, but they are too easily killed by frost, and wash out of sight before winter. Peas were much better, sown in July and August. Vetch proved best of all. It is killed by frost, but covers the ground like a carpet and plows under easily. We are now trying cow peas, and I think these would do well here.

Prof. TAFT: We have been trying spurry on light soils. Sown in July, it is killed down by frost when about two feet high. Crops of corn and wheat have been increased twenty-five to fifty per cent. by one plowing under of this crop. It is a perfect cover for the soil in an orchard. This might not be so desirable in a bearing orchard, where tramped upon in gathering the fruit. I have put strips of clover between rows of trees too large for the cultivation of corn, and got a nice growth and much fertility from them.

Prof. BAILEY: Sown in July, these plants would become so large as to endure the tramping of the harvest. Rye only elaborates what it takes and returns it.

MR. PRATT: Who has had experience with odorless phosphate?

MR. WILLARD and Prof. BAILEY said they could not recommend it.

MR. MORRILL: It is the same thing as "Thomas' slag" or basic slag. I use it as a dust for insecticides, but not as a fertilizer.

Commercial fertilizers were discussed to some length, the conclusion being that all of them have value under certain conditions and in some soils, and none should be condemned without thorough trial.

Closing the Wednesday evening session, following Prof. BAILEY, President LYON read the following paper, which was very cordially received:

#### THE RIGHT OF POMOLOGY TO BE RECOGNIZED AS A SCIENCE.

Science, in the strictest sense of the word, consists in a system of facts or deductions susceptible of absolute demonstration, leaving nothing within its legitimate sphere in uncertainty:

Pomology, however, must climb far above its present level, and reach the solution of many a difficult and perplexing problem, before it can take rank with this class of sciences. Even in case of the less exact sciences, among which we may enumerate botany, entomology, mycology, and perhaps geology, as being in some respects akin to pomology, when taken in its broader

sense, they have been built upon a system of accurately defined facts or principles, and rules of interpretation and nomenclature, which serve as guides to investigation, while the customary employment of significant names, the generally more or less scientific training of discoverers, and especially the use of the dead languages as the source from which their nomenclature is drawn, secures exemption from the coarse, vulgar, and sensational in their make-up.

Pomology, on the other hand, when held to include (as it is ordinarily assumed to do) a refinement of all the essential principles as well as practices of agriculture and arboriculture, and as trenching largely upon the domain of botany, may fairly be claimed to have had an earlier origin than any of those named, since its first lessons seem to have been taught to our first parents in the first garden, while insects, fungi, and the pursuit of agriculture seem to have been entailed as the penalty for disobedience.

Be this as it may, man has, beyond doubt, been a grower and consumer of fruit from the beginning, and therefore in some sense a pomologist.

Even with the experience of 6,000 years, so many, so abstruse, and so variable are the conditions that few of those involved can even yet be said to be definitely settled in the mind of the average practitioner. Ever, as now, the practical application of these principles has been largely in the hands of persons not given to scientific investigation, but inclined, rather, to blindly follow the lead of others.

Under these conditions, the Anglo-Saxon greed for the possession of more land than can be profitably cultivated, and which is gradually but surely sterilizing our farms, is also manifested in the effort to extend a given amount of culture and fertilization over a greater extent of orchard or garden, with the inevitable result of shrinkage of crops, loss of quality, and increased depredations of insects and fungi—particulars to which little attention has heretofore been given, and remedies for which are, even yet, not well understood.

Aside from the foregoing, the influence of soils, climate, and cultivation, in modifying the qualities or peculiarities of plants and fruits, is but imperfectly understood; while, in the matter of special manuring for special purposes, the *ipse dixit* of the manufacturer and vender appears to be almost the sole reliance of the purchaser. The last remark may also be said to apply with equal force to one of the most important steps in the entire process of fruit culture, since it is a customary practice among planters, instead of resorting to trustworthy and disinterested sources for the selection of varieties, to leave such selection to the nurseryman or his agent, interested as he must necessarily be in disposing of what he may deem most profitable to himself.

The same diversity of opinion also exists respecting the best methods of pruning and training, since, among those who assume the role of instructor, the systems, if systems they may be called, are almost as numerous as their advocates; while the dates proposed include the entire year, and this, too, in many if not indeed in most cases, without regard to the object for which the work is to be done.

Of all the particulars in which this lack of matured system is observable, probably none are more notable than are the insufficiency of even many of the most complete descriptions of fruits as a means of identifying the varieties intended, and the system (if worthy to be called system), upon which the present nomenclature of fruits has grown up.

Not only has the enormous modern increase of named varieties necessitated the abbreviation of descriptions till the particulars needful for identification are nearly eliminated, but even when thus emasculated the bulk still far exceeds the limit of profitable book-making, calling imperatively for the elimination of the mass of worthless trash which now encumbers the pages of our text-books.

Even worse than this may justly be said to be the outcome of our nomenclature as it exists today. A person of rowdyish notions discovers a strawberry and sends it forth as Big Bob. Another sees value in an apple which came up and fruited near an out-building, and gives us the Smokehouse. In similar ways we obtain the Sheepnose, the Hogsnout, and others. In some, to me, unaccountable manner, some highly imaginative person has given us that delectable, the Snorter. But enough—we scarcely need even allude to the colonels, generals, admirals, presidents, emperors, empresses, princesses, and various other high dignitaries which lend their brightness to our lists, since they include almost every gradation from the czar apple down to the swindle strawberry.

Let us, in thought, imagine a botanist, a mycologist or an entomologist instinct with a consciousness of the dignity pertaining to those sciences, as indeed to all science proper, called upon to enter into his vocabulary names of the questionable character already indicated, or a convention of men of this character called upon to consider and endorse them as current names in a scientific list. Does any one for a moment doubt that they would be ignominiously rejected? Suppose, further, that such an assemblage were asked to recognize, as a proper scientific vocabulary, the fruit lists of our present pomological text-books, with their numerous names of questionable character and the very numerous iterations of the same name, to represent distinct fruits, as well as the still more numerous repetitions of the same word, usually the name of a popular fruit, used to represent another, with merely a subsidiary distinguishing word.

There can scarcely be room for doubt that, if such question could be thus presented, we would be summarily told to take back our lists; eliminate the Singed Cats, Sheepnoses, Hogsnouts, Snorters, and Big Bobs; purify, simplify, and systematize it, after which they might be willing to give it consideration.

It may be truthfully alleged that the American Pomological society has already adopted rules which, enforced, would produce results such as we indicate; and it is moreover the fact that, so far as its proceedings and its catalogues go, it has, to a considerable extent, applied such rules, though mainly only to recent introductions, which enter into its transactions.

What is necessary to the full carrying out of such reform is, that a competent authority be constituted and charged with the duty of thoroughly carrying through the needful reformation; and, acting as umpire, applying the test to all subsequent introductions, with reference to both quality and value, including the propriety of the nomenclature as well. The National Division of Pomology, which has the government as its backer, and is continually in session, with a corps of experts and excellent facilities for such work, is apparently the most competent and effective tribunal for the purpose.

*Thursday Morning Session.*

The final session, that of Thursday morning, was called to order by Vice-President MORRILL, and the first business was the reading of a brief paper upon the advantages of Oceana county as a fruitgrowing district, by Mr. C. A. HAWLEY.

Following this, Mr. MORRILL said he and others had visited the orchards of Messrs. HALE and ADAMS, and found them to be two very fine ones, slightly weakened by overbearing, perhaps, but with no other ground for criticism. He advised better heading in and filling in of top, as a rule, in Oceana county orchards, and more attention to borers. These may be successfully combatted by piling earth about the trunks in May and removing it in October. This protects the tender bark at the crown of the tree, where the eggs are laid, and if any are deposited above the earth they are readily discovered and removed. There is noticeable here considerable damage by borers. The plums are exceedingly fine, the strawberries excellent and healthy; grapes, blackberries, and raspberries, the finest he had ever seen. The pears are good, too, especially the dwarfs. It is indeed a grand region, full of the highest possibilities of horticulture; but more attention must be given the peach trees, for, although no evidence of yellows is noticeable, there is not so thorough cultivation as should prevail.

Reports of committees were made and adopted, as given below, the secretary moving a special vote of thanks to Prof. BAILEY for his valuable aid to the meeting, others joining in expression of appreciation of the same:

## REPORT ON EXHIBITS.

The committee reports that it finds an unusually beautiful display of flowers and some interesting plants, comprising the following list: W. B. ANDRUS, plates of apples, comprising Ben Davis, Paw Paw, Jonathan, Stark, Baldwin, Golden Russet, and one unknown variety; S. J. BATES, Shelby, three branches of apricots; also, similar specimens of growing fruits, by E. J. SHIRTS and C. A. HAWLEY; MRS. STEVEN INMAN, Shelby, two vases of peonies, snowballs, and other plants; MRS. A. ADAMS, Shelby, one vase of Tartarian honeysuckles; Michigan Agricultural College, by Prof. TAFT, two plates cut flowers, comprising tuberous begonias, carnations, ferns, rhododendrons, clerodendrons, and others, also two pitchers of irises, peonies, aquilegias, orchids, and other plants, and a spray of aristolochia elegans; MRS. F. O. ROUSE, Shelby, a beautiful pyramid of pansies; MATE CUSHING, Shelby, a jar of pansies; and other flowers by various women.

S. D. WILLARD,  
L. H. BAILEY,  
A. S. PACKARD,  
MRS. C. A. SESSIONS.

## RESOLUTIONS.

The State Horticultural society has, at all its meetings for the past few years, listened to marvelous accounts of the wonderful adaptability to the growing of plums and peaches of the hillsides of Oceana county, and was glad to accept the invitation of your society to meet here at this time. We have been gratified at the local attendance and at the interest shown.

*Resolved*, That our thanks be extended to the members of the Oceana County Horticultural society, and residents of Shelby, for the hospitalities extended. We thank the ladies of Shelby for the bountiful collation provided for us the first day of our session; the Shelby band, by their beautiful music, proved very attractive to the people in bringing them out, and was quite a surprise to the visitors. We certainly owe them our hearty thanks for their gratuitous services. The value of our meetings is greatly increased by the notices and reports of the local papers, and as we have been highly favored by the Shelby Herald, we extend our thanks to the publisher.

The meeting then finally adjourned.

## PROCEEDINGS OF THE ANNUAL MEETING.

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HELD AT LAWTON, DECEMBER 27, 28, AND 29, 1894.

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Seldom has the Michigan State Horticultural Society held a larger or pleasanter meeting than was its twenty-third annual at Lawton, the 27th, 28th, and 29th of December. At no time were there less than 200 persons in attendance, while at times there were more than 300; and nearly every one of them was a fruitgrower, save as he brought his wife along.

The meetings were held in the comfortable town hall, and every provision was made for the entertainment of the very many attendants from about the state, nearly every quarter of which was represented, and never did they receive a heartier welcome.

One of the pleasantest features of the occasion was the music furnished by a company of singers who seemed to think no sacrifice of time too great for the pleasure of their guests, and whose songs were both well rendered and pleasing in character. From first to last they were present and ready to respond to every call, and the calls were frequent after their quality was learned.

In great degree, the success of the meeting was due to the labors of the several local committees. These comprised the following ladies and gentlemen, and never did such committees do their work in more perfection: To solicit subscriptions, N. ATWELL, F. E. BITELY, C. DUNHAM; to decorate hall, T. R. SMITH, FRANK STANTON, CHARLES STANTON, R. S. JONES; to furnish music, Mrs. M. H. SMITH, Mrs. HENRY FORD, Mrs. C. D. LAWTON, Miss GERTRUDE BITELY.

Very many of the visitors were taken about the country by their hosts and shown the wonderful vineyards which crown every hill and stretch down into the valley, greater in number than anywhere else in Michigan, and as thickly covering the farms as in the Chautauqua or any of the famed California districts.

## THE EXHIBITS.

A new feature of the meeting was cash prizes offered for exhibits of grapes and apples. Queerly enough, none of the Lawton growers seemed to have tried to save any of their grapes beyond their usual season, and so the exhibits were from other places less famed for their viticulture. The principal one was from the experimental grounds at South Haven in charge of President LYON, but this was not competitive. It embraced thirteen varieties, and, though they were in acceptable condition, Mr. LYON felt impelled to apologize in this regard, stating that the recent warm weather had caught him with insufficient means of keeping down the temperature, and the fruit had rapidly deteriorated on that account. He showed Eumelan, Aminia, Agawam, Barry, Merrimac, Empire State, Downing, Diana, Ulster, Iona, Jefferson, Isabella, and Delaware.

In much better condition was an exhibit of eight varieties made by Mr. A. H. SMITH of Paw Paw. He showed Iona, Gœthe, Salem, Wilder, Vergennes, Catawba, Agawam, and Empire State. These received the prize of five dollars offered by President Lyon. Mr. SMITH also showed a plate of Vicar pears.

Mr. C. P. CHIDESTER of Battle Creek showed plates of two of his seedlings, Nos. 2 and 3. These are black grapes of superior quality. One of them, No. 2, has a remarkable flavor of the strawberry. Whether this is peculiar to it in its earlier stages of maturity we did not learn, but in any event it is a most desirable table variety. Its strong skin makes it at once a good shipper and keeper. In general appearance it is like the Concord. No. 3 is a somewhat larger grape, both in berry and bunch, if it may be judged by the specimens shown, and sufficiently good to deserve a name and general cultivation.

There was but one exhibit of apples, which was made by ROBERT L. VAHUE of Allegan, comprising more than a dozen plates and nearly as many varieties. They had not been preserved for show, but were a part of the family's winter store, yet they were fairly perfect specimens of their kinds, and well kept. A plate of perfect Fameuse was notable among them. Their high color and general attractiveness caused them to be much observed, some saying the fruit seemed more like something from foreign clime, so long did it seem since apples were a common Michigan product. Mr. VAHUE received the prize of two dollars. He is yet a boy in his teens, but is enthusiastic in pomology, and will be one day well known in his chosen work.

## THE OPENING SESSION.

Early Wednesday evening the work of the meeting began. President LYON called to order and requested Mr. C. W. GARFIELD to preside. After music, Mr. C. W. LAWTON spoke the welcome of his townsmen, expressing their thanks for the coming of the society, and for the anticipated benefits of the meeting, as well as their appreciation of the work the society has accomplished, in its nearly a quarter of a century of active existence, for the cause of Michigan horticulture. It had been suggested that he was negligent of his identification with the society. If so, he had certainly been derelict of duty. Years ago he had attended the meetings and contributed to the programmes, but had allowed his interest to lapse into "innocuous desuetude," much to his disadvantage, no doubt. He spoke of the important and growing extent of Michigan horticultural interests, and the fullness of their representation by the state society. It was indeed pleasant to once more meet those men whose names are household words wherever horticulture has existence in Michigan. The advantages of Lawton as a horticultural region were pointed out, and becoming reference made to the hospitality of his townsmen and the people of the surrounding country, with whom it is always pleasant to sojourn.

Mr. GARFIELD, in response, spoke of the encouragement he often received, when secretary of the society, in times of depression, from the Messrs. LAWTON and BITELY, who are among the pioneers of pomology at Lawton, and which had remained as a grateful and pleasing remembrance. The society now came not to bring information, but to catch the Lawton people unawares, and to learn how they have accomplished their wonderful development, how they do the things which have made them famous. "It will do us a lot of good and we in turn can tell it to others. It is the strength we will get here that will help us do good work. The standing of the Michigan State Horticultural society and its literature is very high, and have come to a world-wide fame; but that literature is only the records of meetings like this. May it be that when the secretary has put on record the results of this convention, it shall indeed be a red-letter record."

Mr. R. M. KELLOGG of Ionia said he had come to Lawton to make money—to learn how to conduct his business. He declared himself proud of Michigan and her horticulture, and said that, great as had been the loss of prestige at Chicago, from the failure of the exhibit at the World's Fair, yet the good fame of the state is impressed on the people everywhere; and for all the bad results referred to, it is well known that we do produce the best fruits obtainable, of their kind, and that the state is filled with the grandest and best people.

Brief congratulatory remarks were also made by Mr. ROLAND MORRILL of Benton Harbor and Prof. R. L. TAFT of the Agricultural college. Then after another song the following paper was read by Mr. N. ATWELL of Lawton:

#### HORTICULTURE AT LAWTON.

Peach trees were grown in this vicinity from the time of its first settlement. The first peach orchard for market, at Lawton, was set by Mr. N. H. and Dr. E. BITELY in 1858. It contained 500 trees of choice varieties and occupied the high ground near where Mr. FRANK BITELY's house now stands. This orchard bore many fine crops of fruit, and continued in profitable bearing for nearly twenty years, until destroyed by hard winters and yellows. But few peach orchards were set out for several years. These proving profitable induced other settings. In 1875 the acreage of peach orchards was largely increased, and for several years many peach trees were set each year. In 1880 about 100,000 baskets of peaches were shipped from Lawton. Yellows appeared and soon wrought serious injury, and in many cases total ruin, to the peach orchards, and discouragement to their owners. Since then destruction of diseased trees has seemed to hold the disease in check, and at the present time some fine young peach orchards are growing and others are being set out from year to year. A large portion of our peach crop is sold to buyers who come with teams from neighboring towns, the counties south of us, and from Indiana.

Growing raspberries formed a large part of the fruit industry of Lawton for some years, and several carloads were shipped daily during the season, and also considerable quantities were evaporated.

A few of our growers still continue to raise raspberries and derive a considerable portion of their income from this fruit, but the acreage is very much less than it was a few years ago. This fruit has seemed to give way to grapes, for which our soil and location are especially well adapted.

About the year 1865, Mr. N. H. and Dr. E. BITELY, in company with Messrs. C. D. and G. W. LAWTON, were extensively engaged in the nursery business and obtained a quantity of grape cuttings and roots from Geneva, N. Y., mostly Concord and Delawares. From this nursery originated the first vineyards at Lawton. Mr. A. B. JONES is the pioneer grape-grower, and was the first to ship grapes from Lawton. His first vines were set about twenty-six years ago and are still in bearing. For several years the vineyards of Mr. JONES, the BITELYS, and the LAWTONS were the only ones at Lawton; but, these proving profitable, the business was extended and enlarged until it has reached its present rather large proportions. The greatest increase in the acreage has come within the past ten years. The shipments of this fruit have increased from a small quantity of fruit to nearly 3,000 tons the past year, from eight to fourteen cars being loaded with grapes daily during the shipping season.

The leading varieties grown are Concord, Delaware, Niagara, and Worden. As yet the Concord is the only variety that meets with a ready sale in carload lots.

Our grape-growers meet with many obstacles and discouragements, the most prominent being insect enemies of the vine and bud. The climbing cutworm proves very destructive to the buds in the springtime, and in some instances has ruined the prospect of a crop. Many remedies and

preventives have been tried to prevent his depredations. Hunting the worms at night with lanterns has been extensively practiced, and vast numbers of them are destroyed in this way every spring. Sowing buckwheat in the vineyard has been found to prevent cutworms from harboring therein. Cultivating late in the fall is practiced by some with good results. But the most efficient device to preserve the grape buds from destruction by these pests are pieces of tin placed around the base of the vine and also around the trellis posts. These tins are the best protection for young grapes when starting a vineyard. A suitable quantity of these tins has come to be a necessary part of a grape-grower's outfit.

The grapevine flea-beetle, commonly called steel beetle, also works much injury to the young buds. Hand picking seems to be the only remedy for the full-grown beetle, and spraying with some insecticide the remedy for the young of this insect. Vineyards near woodlands or neglected fence rows or brush heaps are most liable to injury from the steel beetle.

Rose bugs in some seasons need close attention. Hand picking each day during the time the grapes are in blossom is the best remedy yet known.

Thorough cultivation of vineyards is uniformly practiced. This cultivation should commence in spring, as early as practicable.

Pruning the vines is a most important part of a grape-grower's duties. The proper time to prune is generally conceded to be any time after the leaves drop in the fall and before they start in the spring. Considerable difference of opinion exists in regard to the proper system of pruning, and consequently no one system seems likely to be uniformly adopted. Practically, any system that does not leave too much wood will bring good crops where other conditions are favorable.

Grape-culture has gained such large proportions in some sections of the United States and meets so much competition from other fruits grown in the south and on the Pacific slope, that the marketing of the crop is the most important question in connection with it. How shall we best place our crops before the consumer is a subject that should receive more attention from fruitgrowers.

MR. C. D. LAWTON: One can see many grapes in a ride about our town, but we can and do grow other fruits. We used to grow the best of peaches, and I believe we could do so yet. Severe winters and yellows have reduced the orchards, and grapes have taken their place as being more certain in yield; yet no one ever set a peach orchard here which put him into debt, and no one ever will do so. Still, we are not sure of a crop each year. At one time, in the early days of viticulture, we refrained from setting grapes, fearing that the few hundred baskets we could then deliver into Chicago would glut the market. Had the real facts been better understood, some of us might have made fortunes long ago. The prices have decreased each year, but grape-growing still remains profitable, and planting of vineyards continues. We have cheap and quick transportation by rail. Carloads of our fruit go to Texas, and Lawton grapes are found so far away as Portland, Oregon. Our visitors, in their rides to-day, were surprised at the varied methods of pruning and planting. At first the

vines were set closer than they are now placed, and we began by growing several canes from the root, instead of one as is now done. Some do this way yet; but in the main there is but one cane and that is trained to two wires, and the vines are set a greater distance apart. Yet it is hard to conform to any one method of training, because of the peculiarities of culture. Many buds are left, because the number is likely to be decreased by ravages of insects and by frost. Many buds are now to be seen which will not be left when the growing season is at hand and these dangers averted. The Wood system is now much in vogue, being many canes spread fan-shape. This year we shipped 200 cars of grapes by freight, 3,000 baskets per car, and 30,000 packages by express. An advantage we have is in the fact that our crop is marketed and out of the way before the bulk of that of western New York is ready. Concords are the standard as yet, for all of the new sorts, many of which are tried. The Concord always sells well, and bears everywhere, while the others fail in some localities. The Concord rots least of all. The Niagara is next in favor. We grow grapes here on all kinds of soil, though the vines are not so soon ready for bearing on the lightest sands, yet they finally do as well. We used to think that only the highest places would do, but such is not the case. Other places will do as well if there are depressions about, into which the cold, frosty air may fall away from the vines. Our maximum elevation is 170 feet above the flats. Grapes grow upon the flats, however, and look as well as those from the heights, but they are less sugary and not so well flavored as those from the hills. The Concord grown here is better than it is anywhere else, so far as my knowledge extends. We know this to be a fact, that we produce this grape at its very best. There has been decadence in the methods of marketing, and there is need of reform in this respect. Lawton used to be a great apple region, but many orchards have been cut out because they did not produce well. Pears do well but are not largely grown. No fruit I grow is more profitable than the pear, and I expect to see more of this fruit produced here.

Mr. KELLOGG: What is your total acreage?

Mr. LAWTON: Two thousand acres and upward.

The secretary presented a large number of reports from different parts of the state concerning the condition of fruit trees and plants, results of the season of 1893, etc., and others were made by parties present, all agreeing that existing conditions were highly favorable. At close of these reports the society proceeded with the programme, first in order being a report from Mr. GARFIELD as a delegate to the meeting of the Illinois state society. He said in substance:

## ILLINOIS SOCIETY'S ANNUAL MEETING.

The annual meeting of the Illinois State Horticultural society was held in Springfield, December 12. It was the thirty-eighth annual meeting, so you may see the society is our senior. The meeting was characterized by intense interest, shown by all those present. In fact, each one seemed to have come to give as well as take, and so the chairman did not have to call out one speaker or another, for all were ready to speak. There were about one hundred members present from around the state, nearly all parts being represented, but the local attendance was very light. Three societies comprise the state organization, the northern, central, and southern. The large exhibit of fruits was brought from the World's Fair, and was from widely separated states. But it was too large, and was off by itself where some did not see it. So it was not, as it should have been, an object lesson. Meetings of the Illinois State Grange and the State Beekeepers' society were being held at the same time, and members of the three organizations seemed to be on terms of hearty friendship and in delightful relations. The discussion upon peach culture was most interesting. It was led by a Mr. GOULD of the southern part of the state, and it bristled with valuable facts. Culture is thorough there, and pruning is like our own, done with view to shorten in the heads of the trees. Another paper showed how a man grows grapes on sandy soil with asparagus between the rows. I should think the closeness of the planting would increase the rot. But the grapes were far apart and grown up high. The author of the paper grows fine grapes, and it is done by a secret process, the use of some fertilizer he does not mention. Another thing I noticed was that in that state, where a lot of men are engaged in growing tremendous crops of blackberries, the Taylor is not known. Home surroundings were discussed, as to bringing horticulture about and into the homes. Many took part in the discussion, and all commended the interesting of women and children in horticulture; yet in the whole audience there was but one woman. We do much better in this respect in Michigan. The secretary of the Illinois society was concerned with the state's exhibit at the World's Fair, and made of it a particularly complete report. Apples were sent to the exhibit by the hundred barrels and grapes by the ton. Nothing was spared to make the show complete, and it was indeed marvelous. I was impressed with the idea that we should not be too awfully scientific at such meetings, but be able there to learn what science can do to aid us. One paper related to those fungi and lower forms of life which are injurious to fruits; yet, after all, it has been shown that three fifths of such growths are beneficial. There are a few points both for praise and criticism. Two hours of most

valuable time were spent in election of officers. If a society has a good lot, why strive to throw them out, thereby consuming time needed for better work, and engendering ill-will? So good a meeting as that was should have been given two or three columns of report per day in the press, and would have had that much in any city of this state, but the Springfield papers gave very little attention to it. But there was admirable arrangement of the secretary's work. Our society is too poor to do as well. But the Illinois secretary had an assistant and a stenographer, the assistant taking down such things as names, horticultural terms, salient points, etc., about which the stenographer might make mistakes, leaving the secretary free for the larger work of his office. The president was prompt and guided the meeting admirably. There was great vivacity of discussion and constancy of attendance—the people were there all the time and not passing in and out. I must remark also upon the high character of the papers presented. I have seldom known them to be excelled as a whole. And never was I treated better. They entertained me as though I were a king or a high-priest. It was all very enjoyable, and I am exceedingly glad I went; nor do I see how we can afford not to send a delegate each year.

Mr. O. W. BARNARD of Manteno, the delegate from the Illinois society to this meeting, expressed his pleasure at being in attendance, but said we must not expect him to teach us much horticulture. The ladies sometimes turn out to the Illinois meetings better than they did when Mr. GARFIELD was there. "I am glad of his criticisms. They are just and will do us good; and pleased also with his praise, for his good opinion is of great value. But while the discussions at Springfield were good, the best of them was the part furnished by Mr. GARFIELD. He will not say it, but such is the fact. I am enjoying this meeting highly, and am astonished at the local attendance—the floor full and the gallery full also. I hope to see more of your meetings and to have the pleasure of greeting your delegates at ours."

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*Thursday Morning Session.*

Beginning the session of Thursday morning, December 28, with the same large attendance which characterized the meeting throughout, President LYON called Mr. MONROE to the chair and made appointment of these committees:

*Resolutions*—Messrs. C. A. SESSIONS of Grand Rapids, R. MORRILL of Benton Harbor, C. P. CHIDESTER of Battle Creek.

*Exhibits*—Messrs. O. W. BARNARD of Manteno, Ills., R. J. CORYELL of the Agricultural College, O. BEEBE of South Haven.

The reports of the president, secretary and treasurer were presented in due order:

#### PRESIDENT'S ANNUAL MESSAGE.

*To the Members and Friends of the Michigan State Horticultural Society:*

LADIES AND GENTLEMEN—It would doubtless be more pleasant to the society, as well as to myself, to indulge in congratulations upon the highly important and valuable results already accomplished, through its instrumentality, leaving the problem of the future to the logic of then existing conditions; yet, with societies as with individuals, little of value is usually accomplished save as the outcome of deliberation, with matured plans and careful and thorough efficiency in their execution.

It is far from doubtful if the great body of horticulturists, to say nothing of our people generally, have an adequate conception of the amount of good, both pecuniary and intellectual, that has inured to our people as a whole, and to practical horticulturists especially, from the gratuitous labors of this society, together with those more or less directly due to its inspiration.

We accord little credit to the person who deliberately avails himself of benefits due to the unrequited efforts of others, while neglecting or refusing to effectively minister to the success or efficiency of such efforts.

There is ample occasion for the application of these thoughts in the case of this society, since there is no lack of those who take the utmost advantage of information and conditions wrought out largely, if not wholly, by its efforts, while yet they refuse, or at least omit, to contribute even the mite of a membership fee toward the promotion or sustaining of such efforts.

This is by no means the first time that I have taken occasion to urge the society to act upon the consideration that there is a degree of inertia in the minds of people, which must be attacked and overcome. The fact should be distinctly set forth that the society lives and prospers only upon memberships; and it should not be forgotten that, while a person may have the requisite dollar in his pocket, fairly throbbing to be applied to this purpose, it may be expecting too much of very many modest men that they shall put themselves forward to proffer the requisite fee, or that many such persons may act out the thought that "what is worth having is worth asking for;" and the asking should certainly and effectively be done whenever appropriate occasion shall occur. To do otherwise is to invite, if not even to insure, inaction and decrepitude.

The efficiency of this, as of other organizations of a voluntary character, must necessarily depend very largely upon the efforts of those more directly concerned in the interests which it is designed to promote. Such being the fact, it is clearly of the highest importance that the society be able to enlist the active coöperation of those engaged in horticultural pursuits.

To this end we have been able to devise no more effective means than that so generally adopted by kindred societies, but which our society has.

rarely availed itself of since it ceased its connection with state fair exhibits. We have reference to the offering of premiums for articles to be exhibited at its meetings. True, the objection of lack of funds must be admitted to be a very forcible one; and yet, it may be urged with quite as much force, such lack might and ought to be more than supplied from the increase of memberships consequent thereon, while the society's sphere of influence would doubtless be correspondingly enlarged.

Several years since, the society for a time maintained what was known as an orchard committee, charged with the duty of examining such orchards, vineyards, gardens, and ornamental grounds as were entered for award, which was generally the society's diploma. It can scarcely be doubted that the effect was to very considerably increase the prestige of the society as well as its general usefulness.

After a time, however, owing partially to an almost chronic repetition of entries and awards to the same objects, and also in part to withdrawal of railroad transportation for the committee, the practice was abandoned for the time.

The period since elapsed has doubtless sufficed to obviate the former objection; while it may be practicable to evade the latter by requiring that, instead of examination by a committee, the entry be accompanied by such treatment of location, soil, age, varieties, treatment, productiveness, condition, and other important particulars as shall be deemed necessary to a proper understanding of the condition, method of treatment, and general value, upon which as a basis an award might be made, either by the executive board or by a committee appointed for the purpose.

Doubtless there may be other and even more effective means of overcoming the disabilities under which the society labors, but surely none of them lie in the direction of supineness and inaction. Whatever may be thought of the foregoing suggestions, the fact is patent, at least to many of us, that there are adverse influences covertly at work against the society, and if it would effectively override such opposition it may do well to recall the myth of the cartman who prayed loudly to Hercules to lift his vehicle out of the rut, but was directed to first put side and shoulder to the wheel and then call for help.

Moral—Providence helps those who help themselves.

#### TREASURER'S REPORT.

*To the officers and members of the State Horticultural Society:*

I herewith present my annual report:

In the treasury, January 1, 1893.....	\$59 10
Received from branch societies.....	104 80
Interest on bonds and mortgages.....	126 00
Annual memberships.....	19 00
Eaton county society.....	12 00
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	\$320 90
Paid seventeen checks aggregating.....	\$219 35
Leaving a balance of.....	101 55
	<hr/>
	\$320 90

Two hundred and six life members, \$2,060, secured as follows: Seymour mortgage, \$1,000; Lytell mortgage, \$300; Snell mortgage, \$300; W. N. Cook mortgage, \$350; U. S. bonds, \$100. Total, \$2,050.

S. M. PEARSALL, *Treasurer.*

*Grand Rapids, December 26, 1893.*

## SECRETARY'S REPORT.

*Gentlemen of the Michigan State Horticultural Society:*

I have the pleasure to report the affairs of the society as being in the main in satisfactory condition. The interest felt in the work of the society by its members, those of the auxiliary societies, and the public in general, seems to be decidedly greater than it was a few years ago, when certain inharmonious elements were actively engaged against us, bending strenuous efforts towards disruption and decay. This is an era of goodwill and peace, and, save in one respect, the society was never better prepared for its work, while never was there more work to be done.

The exception which I note refers to the society's finances. While we have enough to keep going after a fashion, and certainly have made the most of the little means at command, there is no question of the need of more money. But how to obtain it is a puzzle to those who have given the matter attention. At our last annual meeting a committee was appointed to try to secure from the legislature an appropriation for the annual expenses of the society, so far at least as the compilation of the reports is concerned, but no action whatever was taken so far as I am informed. There is reason to believe that an early application to the legislature for a moderate annual sum would have been successful, but when I began the work alone I found it too late.

There had been so many allowances of cash from the treasury, and there yet remained so many which must be made, that the task was clearly a hopeless one. Another plan discussed between President LYON, Mr. GARFIELD, and myself, was not undertaken because of the financial collapse which was at its climax at the time for which we arranged the institution of effort. In the future we may be able to do something in the way designed, which was a sort of endowment plan, but at present there is little hope for success in this way.

However, we have gotten through the year with a little balance on hand, and have assurance that, so long as we are able to keep the expenditures down to what they have been in recent years, we shall be able to go on with a measure of success which does us credit, even though we feel it to be so much less than is possible.

During the year we have held more meetings than we have been able to hold in recent years. There were three—the annual meeting at Ann Arbor, the winter meeting in Benton Harbor, and the summer meeting at Shelby. All of these were well attended and successful in great degree. The papers read at these meetings were in the main of high quality, the several societies with which they were held expressing themselves as highly satisfied and requited for their efforts and expense.

There has been little increase of local societies during the year. On the other hand, I am sorry to say, three have become inoperative, if not quite extinct. The one new one is that of Gratiot county, with headquarters at Ithaca. There have been no meetings of the Sanilac or Port Huron societies, nor of the Michigan manufacturers of fruit goods. The failure of the latter is due to the repeated failure of the apple crop, which left its members little business to do and no incentive for meetings. But this state of things is likely to take a favorable turn if this year of '94 shall see the orchards once more productive.

There have been several new organizations of the type of the Lawton fruit shippers' association, which are of a purely commercial character, yet

of exceeding value to those fruitgrowers wise enough to identify themselves with them.

No further development of the plan of co-operation between this society and the national department of agriculture can be reported. The good intentions of Secretary WILLITS seem to have been checked by some fungus of unprogressiveness or bacterial disease of finance, or simply dry rot of innocuous desuetude. However this may be, I have received nothing from the department, for distribution, since the arrival of the first and only bag of old reports and bulletins. It was a good plan, but as the present secretary seems bent upon showing how much money he has not spent, rather than the results he has accomplished, I do not expect to learn of any advancement of the scheme.

The Reports of this society continue to be in great favor and demand, not only in this country, but far abroad. I have during the year sent volumes to New Zealand and Germany, while applications for them come from all portions of the United States. Particularly is this the case from the northern Pacific slope, the horticultural conditions of which are sufficiently like our own to make our transactions of great practical value. I am sure it would cause renewed interest and pride in our work, on the part of every member, had he read the words of commendation which were sent in response to my circular of last winter, to societies throughout the country, offering exchange of reports or gifts of them to experiment stations, libraries, etc. In every case was the offer accepted with apparent keen pleasure.

Your secretary has some very decided opinions about what was miscalled the Michigan fruit exhibit at the World's Fair, but as this subject is to be handled by those more intimately concerned, remarks upon it here are quite needless. Perhaps it is true that the less we say about it the better we will feel, and it would have been as well to have omitted the subject entirely from the programme, but for the poor satisfaction we weak mortals get from saying "Didn't we tell you so?"

The year 1893 was a season of mainly satisfactory fruit yield, except as to apples. What little we produced of this fruit was to be found in the northern part of the western "fruit belt," even as it was last year. The crop of peaches was abundant everywhere, and sold at satisfactory prices. The yield of grapes was unprecedented, and of excellent quality. The fruit sold at very low prices, and in many cases, no doubt, the crop was unremunerative, though its vast amount secured a margin, greater or less in most cases. The strawberry crop was somewhat short on the whole, and the prices good on that account as well as because of the partial failure in regions further south. Other small fruits in the state, as a whole, were not in full supply. It is the general belief among apple-growers, as well as the earnest hope, that the coming season will be productive of an old-time crop of this staple fruit. The trees did not suffer from the fungus which devastated them the preceding two years, but made a healthy growth of foliage, and have gone into the winter in excellent order. Details of these conditions have already been given you in the reports from many localities of the state.

While there have been most gratifying advances in means and methods of combating most diseases and fungi, absolutely nothing can be reported as to success in repressing yellows. While there have been seasons when development of this disease, has been more startling than in 1893, still, its march has been steady, and it has invaded localities where

enforcement of the law has been most faithfully observed. Planting of new trees continues in these vicinages, but the men who predict the extinction of peach-growing where it now most flourishes, are no longer regarded as mere croakers.

The receipts and expenditures of the year have been as follows, the treasurer's report showing the condition of the society's investments:

Receipts from annual memberships .....	\$19 00
From auxiliary societies .....	116 80
Interest on bonds and mortgages .....	126 00
Balance on hand December 26, 1892 .....	59 10
<hr/> Making the total receipts .....	<hr/> \$320 90
 The expenditures have been .....	 219 35
<hr/> The net balance now on hand .....	<hr/> \$101 55

The expenditures may be classified as follows:

Voted secretary as salary for 1892 .....	\$50 00
Printing .....	38 75
Expenses connected with Annual Report .....	3 15
Expenses of secretary's office .....	42 61
Expenses of quarterly meetings .....	79 19
Expenses of library .....	5 65
Balance on hand .....	101 55
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	\$320 90

EDWY C. REID, *Secretary*.

MR. GARFIELD moved that a committee of five, none of whom should be of the present official members, be appointed to nominate officers for the ensuing year, to report later to this session. The chair named Messrs. J. N. STEARNS of Kalamazoo, A. S. PACKARD of Covert, H. H. HAYES, of Talmadge, R. M. KELLOGG of Ionia, and W. W. TRACY of Detroit as such committee.

Upon motion of Mr. MORRILL, Mr. BARNARD of Illinois was made an honorary member of this society. Mr. Barnard made acknowledgment of the honor in graceful and appropriate manner.

An intermission was taken for receipt of new members, after which Mr. MORRILL read the subjoined paper upon

#### POSSIBILITIES IN HORTICULTURE.

Horticulture is a science that most nearly of all illustrates the quaint saying of Robbie Burns, that "The best laid plans o' mice and men gang aft aglee." So charming in the prospective, giving the fullest satisfaction, when entered into intelligently and pursued with care and industry, but often resulting in disappointment when undertaken without these essentials. It may be very correctly divided into three distinct branches, each having a different object.

## A KIND THAT IS ALWAYS PROFITABLE.

First, we will consider ornamental horticulture, which includes all planting of ornamental trees and shrubs, the culture of flowers or anything that tends to adorn and make beautiful our homes, farms, and highways, bringing happiness and contentment, making rural life more pleasant than a life in our great cities can ever be. It is the only branch of horticulture that never disappoints nor proves unprofitable. No man ever made a mistake who has set and properly cared for an ornamental tree or plant on his own premises. In addition to the pleasure himself and family derive from it, he has certainly enhanced the value of the property many times the cost. In fact, the surest way to sell a farm for a good figure is to make it neat and beautiful. It is easily accomplished at small expense; besides, the owner secures a certain respect and admiration for himself and family by the public that is not secured by any other means, because it is generally conceded that the man who loves the beautiful in nature and surrounds himself with beautiful things can not be a very bad man.

The skill of the trained landscape gardener reveals wonders to us in our beautiful city parks and private grounds, but he claims no monopoly. Any farmer can study them and take pattern after any portion, and can get ideas which he can follow out at a very small expenditure of cash and time. It will open up new pleasures in life for him. Don't say that you can not afford it, but study it and see if you can afford not to do it.

## THE EXPERIMENTAL SORT.

The second branch of horticulture we will call the "experimental." This is attractive to very few men, as there is seldom any profit in it. Still, some of our brightest men are continually engaged in producing and testing new things — hybridizing, crossing, and using all the arts known to the profession, in their efforts to produce something superior to those already in existence. Full well they know that if they succeed it can not be profitable, as the public stands ready to tear it from them and distribute it among themselves like a pack of hungry wolves. He can not get a patent nor copyright on his production, neither can he lock it up, so his labor must be a labor of love. Our country is fortunate in having well-conducted experiment stations which are constantly testing new varieties of fruit and sending the results broadcast over the country in bulletin form, thereby saving the commercial fruitgrowers millions of dollars and many years of time that would otherwise be lost.

## HORTICULTURE FOR CASH.

The third branch of horticulture we will designate as "Horticulture for revenue only." This branch commands the most attention of any in Michigan. A very large proportion of the southern peninsula is remarkably well adapted to it, as is evidenced by the immense crops of fruit and vegetables annually marketed here. It is doubtful if any industry in our state today represents larger investments or contributes more largely to the prosperity of our people. These crops, with wheat, are known as the cash crops.

The principal object of this paper is to call attention to the possibility of extension and improvement in this line. The limits of such a paper

precludes going into details, so we will confine it to general statements which can be proven correct. That nearly all of southern Michigan is remarkably well adapted to the profitable pursuits of commercial horticulture, having nearly perfect soil, climate, locations, and transportation facilities, with the best of markets near by, has long been known to those who have given the matter any thought. Why these advantages have not been more generally recognized and acted upon, is a mystery. Many a farmer in this state works hard the year round for his board and clothes and taxes, yet he sleeps every night on a gold mine, but has not the courage to develop it. Still, he shows remarkable "nerve" when he sows 40 to 160 acres of wheat, or tenderly cares for a large flock of sheep, growing "free trade wool," knowing that he is working for less wages than his hired man gets. Most of our farmer friends know what it costs them to grow a bushel of wheat or a pound of wool, and none will claim any profit at present prices.

#### COST OF PRODUCTION PER BUSHEL.

How many men, even among those engaged in the business, know the cost of a bushel of fruit? Let me tell you something about that. Where fruit is properly planted and well cared for, the following figures are the extreme limit of cost in southern Michigan, and a large portion of the very finest fruit sent to the market costs less: Apples, 15 to 25 cents per bushel; pears, 25 to 40 cents; peaches, 30 to 40 cents; plums, 40 to 60 cents; strawberries, raspberries and blackberries, 25 to 40 cents per bushel; grapes,  $\frac{1}{2}$  to  $\frac{3}{4}$  cents per pound; cherries, 25 cents per bushel. These figures mean fruit ready for market, but not picked. The cost of marketing is variable, so each can determine that for himself. Fruit is grown more cheaply by the highest culture and fertilization than by slovenly methods. The above figures take into account all the cost of trees or plants, all the labor and fertilizers necessary to first-class work, while the estimate for production is not more than fifty per cent. of what is frequently produced under such culture.

It is not necessary to own the earth in order to successfully engage in horticulture. I have in my mind a locality where the average farm is ten to twenty acres, naturally poor soil, but worth now \$200 to \$1,000 per acre, the owners making more money, and living easier and better, than farmers on 80 to 640 acres of prime land. These people give their children good educations, have plenty of music and good reading, work hard all summer, loaf or amuse themselves as they see fit all winter, and enjoy life.

#### LOCATION—PROFITS—SWINDLERS.

I presume some will ask what are the conditions necessary to successful fruitgrowing. In a general way I would say that our high, rolling lands of moderate fertility are well adapted to the growth of peaches, grapes, cherries, and small fruits; and, if the soil is a clay loam, add the apple, pear, and plum. On good level lands, all the above fruits succeed except peaches and grapes, which are not quite so safe in such locations. Still, they are generally satisfactory if proper varieties are planted. On the lower levels the small fruits do well, as do dwarf pears and quinces, while our swamps are proving to be bonanza farms in the growing of celery, onions, cabbage, potatoes, mint, etc.

To give statements of exceptional profits in fruitgrowing might prove misleading, but I will say that it is a common experience, with orchards and plantations of small fruit, to find some year in which the profits pay all the original value of the land and all the expenses of growing it, from a single crop. In the case of some fruits, notably gooseberries, which are the cheapest of all fruits to grow, rarely costing over ten cents per bushel, I have seen a plantation pay for itself, land and all, each year for five years in succession.

A word of caution might not come amiss here. The country is full of disappointments in horticulture because growers have depended on deceptive plate-books and glib-tongued, lying tree peddlers for their horticultural knowledge, buying unheard-of and impossible varieties, paying out their hard-earned wheat money for brush-heap trash at three or four times the price of well-known profitable varieties. Of course, there are such things as reliable agents of reliable nurseries, but they are never selling nor offering impossible things, and the only safety lies in dealing with well-known and reliable nurseries.

#### WHAT AN ENERGETIC YOUNG MAN MAY DO.

A few horticultural possibilities might be mentioned. It is possible for a young man to purchase a farm and pay for it easily by a little intelligent planting and care of fruit. It is possible for the farmer who is heavily in debt, and sees no hope in farm crops, to pay the mortgage by fruit or vegetable growing. It is possible to keep the boys at home and give them a good start in life by giving them the use of a few acres of land and helping them to get it well set in fruit; and I will guarantee that in a few years some of them will be able to show a better annual bank account than the "old man" with his 160 or more acres. So, be careful or you may catch the fever and go to growing "briars and trees" and "garden sass."

Some one asks, how will this be, when everybody goes to growing fruit, and there is an over-production? My reply is, that was the question twenty years ago, and that condition has not arrived yet, and I see no occasion for alarm until our own state can get all the good fruit her people wish to use, which time has not yet arrived. Of course, our great city market, Chicago, is often overloaded for a few days, as was the case with grapes last season; but who is to blame? The good people of Lawton grew an enormous quantity of grapes last year, and dumped most of them into Chicago. At the same time, some of them returned, passing through their town on the way to Kalamazoo, Jackson, and Grand Rapids, while small towns all over the state had none.

The conditions necessary to profitable fruit-culture are easily enumerated, but not so easily understood. Therefore, no man should enter the business extensively at first, unless he has prepared himself by securing the fullest information obtainable regarding varieties, his location, transportation facilities, markets, etc. Where these conditions are fully understood success should be almost certain.

The plan of planting large acreages to specialties is unsafe for beginners, and is only advisable after the owner has demonstrated its success on his soil, and under his management. Better plant several varieties at first, reserving enough land to make extended plantings of the successful kinds.

## PLEASURES OF HORTICULTURE.

Horticulture as an occupation is one of the pleasantest known to man. It is also the first. Mankind made their debut in a garden, and if they had heeded the plain instructions they would have remained gardeners, and a world of sin and suffering been saved their descendants. From that day to this, horticulture has been the most honored of all occupations. Rich and poor, high and low, learned and ignorant, kings and queens, as well as the lowly cottager, all practice it in some form, and all take equal pride in their success. The only exception to this rule that I have ever met, is an occasional top-heavy American farmer, who, perhaps, by dint of working fifteen to eighteen hours per day and living on a diet of bread and potatoes with pork and grease, has made a success growing hogs, corn, and wheat. Some of these gentlemen profess contempt for the able-bodied men who grow "trees, brush, vines, and posies." We can overlook this man's lack of courtesy when we remember that his associations have given him an exalted opinion of himself, while his diet has given him a disordered liver.

In conclusion, let me say that whether you are already engaged in horticulture, or expect to be in the future, be careful to start right. Be honest in all things. Follow the golden rule when you pack fruit for market, as well as in your other dealings. In short, be a man, love your neighbor, and trust in God. Then, when your labors are ended, you will have little to regret of the past and everything to hope for of the future.

## PRESENT PEACH-CULTURE AT BENTON HARBOR.

Mr. LAWTON: How successful is peach-culture at St. Joseph now?

Mr. MORRILL: The orchards now are comparatively young. They all went out, absolutely every tree, but they have been replanted until there are now 200,000 to 300,000 trees, the oldest about seven years of age, and they are as fruitful now as they were originally. Better sorts are now grown than in those earlier years, kinds which bear one or two years younger than the kinds set first, and thereby the danger of loss by yellows and cold winters, before profits are realized, is decreased. My ten-acre peach orchard netted \$750 the third year, \$1,950 the fourth year, and \$2,200 this year. The fruit had to be thinned each year. This season from 1,300 to 1,500 fruits per tree were removed. Our people are assiduous now in removing yellows. The commissioners of Benton Harbor township could this season find but an average of one affected tree per day. Over 200,000 trees will be set the coming spring. Varieties best with us are Lewis, Gold Drop (this paid me best of all); my neighbor, Mr. MORLEY, grows Crawford's, principally, and we both make money; Early Rivers, Barnard, the Crawford's, Snow's Orange, and Smock have all done well; I have excellent results from Kalamazoo, the peach originated by Mr. STEARNS, which I believe to be the best peach ever set in Michigan. It is a large

peach, yellow, ripening between the Crawfords, and the fruits grow larger as the trees grow older.

Mr. STEARNS: I exhibited this peach at the state fair seventeen years ago, and it was awarded the premium as the best of the sixteen seedlings on exhibition. It was named the Kalamazoo by the committee on awards. The original tree was a Yellow Albert, the parent of Barnard, and this peach was first borne on a sprout from the roots below the bud.

#### ENTHUSIASM NEEDFUL TO SUCCESS.

Mr. W. W. TRACY of Detroit: In my travels over this and other states I see men, farmers, who have toiled all their lives but who yet must sell and abandon their farms; others who can not get out from their burden of debt, while others are making money, both from farming and fruitgrowing, in the same localities. I find that the successful men are the enthusiastic men—the others complain, dread their work, and discourage all about them. Mr. TRACY proceeded with a strong plea for the ornamentation of homes and grounds, by use of flowers, trees, and lawns. This, he said, he did not from mere sentiment, but as a consideration of hard, business-like sense. Make the home beautiful, that you may make it enjoyable for yourselves and your children. If you fail to do this, you fail to get the best and most out of it.

#### TRANSPORTATION — DISTRIBUTION.

Mr. CORYELL of the Agricultural college spoke of the reshipment of fruit from Chicago to interior points in Michigan and other states, and said that while the Lawton growers were sending grapes to Chicago and getting eleven cents per basket for them, Lansing people were paying from twenty-five to thirty-five cents per basket. He urged direct shipments to such towns as Lansing.

Mr. HENRY FORD, in answer to a question, said the present rate on grapes from Lawton to Chicago was twenty-four cents per 100 pounds, and said they are not yet able to get any such rate to Lansing.

Mr. MORRILL: Ornamental horticulture is the only kind which never proves unprofitable.

Mr. ATWELL: There is much difficulty in getting satisfactory rates to other points than Chicago, and until the growers are organized, so as to know how much fruit is needed in interior towns, they would be likely, each sending for himself, to glut such limited markets.

Mr. FORD: If at Lansing and other such towns we could get orders for car lots, we might be able to get much lower freight rates, but no such quantities are wanted there.

Mr. N. W. LEWIS of Gobleville: We have been raising fruit at my town, and when we were ready to market some of it, we wrote to Mr. ANGELL, superintendent of the express company, who came there and made reduced rates for us, assuring us that as production increased the rates would be proportionately modified.

#### MAY THERE NOT BE OVER-PRODUCTION?

Mr. A. C. GLIDDEN of Paw Paw: Mr. MORRILL said something of the effects of association with wheat and hogs. There may be more or less truth in that. Now, can farmers in the southern part of this state go to growing fruit instead of wheat and hogs, and be reasonably sure of satisfactory cash returns?

Mr. MORRILL contended that they could. The "top-heavy" farmers, those who sneer at "growing briars," are decreasing, while the men who are paying off the mortgages are the ones who grow fruit. Loans are more easily obtainable by fruitgrowers than by farmers, and their lands sell more readily if sale is desired.

Mr. VANFLEET of Lawton: I think the business of growing fruit in this region will be overdone, just as years ago the business of raising hogs was overdone.

Mr. MORRILL: The matter of over-production takes care of itself, and fruitgrowing is safe as a pursuit because so many of those who start will fail on account of bad culture.

#### DISCARDED SORTS OF PEACH.

Mr. LAWTON: What old varieties of peach have gone out as Mr. MORRILL alluded to?

Mr. MORRILL: Well there are a number, such as George IV, Keyport White, Morris White, the Oldmixons, and there are far less of Crawfords. Just now Elberta is more largely set than any other, but it has not been thoroughly tried, and so I did not before mention it. Crosbey and Champion are set experimentally. Elberta shows much curl-leaf.

#### IMPOSSIBLE TO GET FULL RECORDS OF SHIPMENTS.

Mr. C. J. MONROE of South Haven (who had undertaken to prepare a statistical paper upon the fruit product of 1893): I have been unable to complete my statistics, though I had hoped to do so. But, everywhere, the production of fruit is increasing, in all fit places. This will soon make a record of production a necessity. Now it is impossible to get from transportation companies the results of their season's carrying, they claiming

that to disclose such facts interferes with their business. Over one half of the township of South Haven is yet unimproved, Casco, in Allegan county, being the locality of our main product; but now Covert, to the south of us, is rapidly increasing. There is no need of fear of over-production. It will be a long time before we can overdo the business if proper distribution is secured.

Mr. BARNARD of Illinois: Has anything been done in Benton Harbor toward canning or evaporating the surplus?

Mr. MORRILL: We have provision for both. There are two very large factories.

#### ANNUAL ELECTION OF OFFICERS.

Here the committee on nominations announced themselves ready to report. Their recommendations were unanimously adopted, the secretary being instructed to cast the requisite ballots, which was done with this result:

*President*—ROLAND MORRILL of Benton Harbor.

*Secretary*—EDWY C. REID of Allegan.

*Treasurer*—EVART H. SCOTT of Ann Arbor.

*Executive Board for three years*—C. W. GARFIELD of Grand Rapids and F. J. RUSSELL of Hart; to fill vacancy, one year, T. T. LYON of South Haven.

Following the annual election of officers came the reading of the subjoined paper by Mr. J. N. STEARNS of Kalamazoo, his subject being:

#### FRUITS I HAVE FOUND IT PROFITABLE TO GROW.

For more than twenty-five years it has been a constant study with me to know what to plant for profit and how to get the best returns out of what I have, and I doubt not that is what has brought the most of us here today, the hope or wish to learn more on this line.

There are certain fruits that, if managed properly, nearly always pay, on account of their keeping and handling qualities.

Among the former we might mention the strawberry and peach, and of the latter the gooseberry and pear.

When I first commenced growing fruits for market, I found the red raspberry one of great profit for several years, not selling a quart in Kalamazoo for less than twenty-five cents net, boxes returned. I had the monopoly of the market, and when it was likely to be overstocked I would make a few shipments to Detroit and Jackson, so as to keep the price up in our own town, where I sold the most of my crop. But this state of things could not always last in this progressive America. My neighbors soon began to think there was money in growing the raspberries, and there grew up sharp competition and low prices, so for several years there has been but little profit in the raspberry.

I will say here that my remarks in this paper will apply mainly to my experience in fruitgrowing in South Haven.

I have found the strawberry to be a profitable crop (not to use Chicago as a market, as a rule), the fact being that South Haven is at least a week later than towns in the interior of the state in the ripening the same variety of fruit. By selecting best late-ripening sorts, keeping back with mulching, I am able to put fine fruit in Kalamazoo just as the crop there is finishing up, often realizing \$2 per case for the bulk of the crop.

The next in the order of ripening are the gooseberries, and of all the fruit I grow these pay the best for the labor put into them. I have now planted of this fruit about two acres.

Some six years since, a prominent nurseryman was at my place and I was showing him my plat of one-half acre and telling him what it was paying me. He remarked, "I would plant five acres at once;" but I felt somewhat as I have often heard the remark made thirty years ago in western New York in regard to apples, that "In ten years you can not give away apples," and some were then digging out their orchards, but have since replanted and harvested very profitable crops. The apples could be bought then for \$1 per barrel. Last year and this the same apples retailed for \$5 per barrel.

I have been shipping gooseberries to Chicago for twelve years, and \$1.25 per case was the highest I could at first obtain. This season, from one half acre, I picked 160 cases, and they sold for \$1.60 to \$2.

But the gooseberry is a gross feeder, and to produce heavily must be liberally manured. I used ashes and well-rotted manure, applied separately.

I have tried several sorts, but, so far as my experience goes, I would rather have one acre of Downing than two of any other.

I have grown the blackberry for twenty years and find it pays well, not for the Chicago market, however, although I send hundreds of cases through Chicago to other markets in Illinois.

I grow Snyder, Taylor, Kittatinny, Wilson, and Erie. I find Snyder most profitable on sandy and Kittatinny on clay soils. I have observed many make the mistake in not heading the Snyder in closely enough, allowing it to set more fruit than it can properly mature. It should be headed back one half shorter than Kittatinny.

I now come to the peach, which we all know pays fairly well in localities where reasonably sure of a crop. I have of this fruit about 2,500 trees in bearing, but here again one needs to live about two lives, the first to learn how and what to plant.

I have planted quite a good many Crawfords and Wheatland in the past twelve years, not one of which has ever paid for the ground on which it stood. I doubt, if my forty acres were all planted to Wheatland, I would have five bushels, in the best peach year. Now, I am not speaking disparagingly of these sorts where they produce well, for there are no better selling peaches; but my experience with the Crawfords, when they do produce, is that if we bring in five bushels we might get two No. 1 and two No. 2, and the other bushel only fit for Chicago. You say that is a little hard on Chicago, but it is right, just the same.

I want to diverge just a little here, and give some of my experience in shipping peaches to Chicago. Several times I have tried this: I would put up, say, fifty baskets of No. 1 peaches, every peach select, and put my card in, guaranteeing it such. Then I would put up fifty baskets of culls, ship at same time—not a cent's difference in the returns.

So now they get all my culls, and orders and other towns get the best fruit.

I have one dealer in Illinois to whom I have shipped a large amount for seven or eight years, and he did not sell a peach for me the past season for less than \$2 per bushel, and the most of them brought \$3 per bushel.

As I presume I will be asked, I will give my choice for 1,000 trees, which would be about as follows, of those I have fully tested: 50 Lewis, 100 Richmond, 300 Kalamazoo, 100 Sturtevant, 300 Golden Drop, 100 Smock, and 50 Salway.

I find the pear a profitable fruit. Of this I now have planted about 1,500 trees, and I will say I have more faith in this fruit for profit than in the peach in its most favored locality. It is less work to grow and is easier handled, being not so perishable, and I am enabled to get full better prices. The same party in Illinois, spoken of in the sale of peaches, sold every pear I sent him at \$8 per barrel, and the culls sold in Chicago for \$1.50 to \$1.75 per bushel.

It is said the great drawback to growing pears is the blight. I have no more trouble with this than I do with yellows in the peach, which I head off by eternal vigilance and promptness in cutting out. Some seasons I have found it necessary to go over my pear orchard every week, regularly, and cut out every affected twig. The past season I have not had a twig of blight nor a tree of yellows.

I cultivate my pear orchard as thoroughly as I do the peach, and have done so for fifteen years. I am a full believer in thorough cultivation for every fruit, from the strawberry to the apple.

The two pears I find paying best are Angouleme, dwarf, and Bartlett, standard, but the former, to do well, should be planted on good, strong soil.

If I had not soil, then I would plant Howell and Louise Bonne instead. Of course there are several other sorts very desirable to have, but those mentioned above I have found most profitable.

To sum up, with close attention to marketing, for the time I have been in the business, I have found the growing of these fruits to pay: The strawberry, gooseberry, blackberry, peach, and pear.

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#### *Thursday Afternoon Session.*

At the opening of the session of Thursday afternoon, President LYON spoke briefly as to the change of officers, the presidency especially, effected by the vote of the morning, saying it would be found to be highly advantageous to the welfare of the society. He had often before urged that it be made, and so was more than pleased that it had now been accomplished, though it was with regret that he severed a relation which had been so pleasant. He warned against the entrance into the work of the society of too much of the commercial spirit, instead of giving aid and

advancement to that which in quality is best. He hoped the incoming president would appreciate the importance of this, and not, so far as his work and influence was concerned, subordinate all to pecuniary considerations. The value of the best for use at table and in the home should receive at all times the society's preference. He hoped to be thought of in the future as one who had earnestly tried to do something for the benefit of the horticulture of Michigan.

Mr. PEARSALL, the retiring treasurer, made similar expression of his feelings. The society had, he said, been of great benefit to him, much more than he could possibly have been to it. He spoke with deep concern of his personal relations to members of the society during the time of his seventeen years' connection with it as treasurer, and in speaking his farewell paid a warm tribute to the personal worth and services of President LYON.

Mr. MONROE said many of those present would like to take time to say complimentary things of Mr. LYON and his work, but the large waiting audience made it desirable that such expression be left to the committee on resolutions.

Mr. LAWTON: Mr. LYON modestly says he "hopes to be remembered as one who has done something for the horticulture of his state." He does not belong to this society, nor to the people of this state, but to the whole country. Long before this society was organized, I received aid and advice from Mr. LYON, in the beginnings of my horticulture at this place, and it was the best advice I could obtain anywhere. His work and his honored self belong to the whole people.

Mr. MORRILL quoted what Mr. STEARNS had said about the bad character of the Chicago market so far as returns for the best grade of fruit are concerned. He had found that for the best fruit he could get better prices in Chicago than in any other place.

Then was taken up the regular work of the afternoon's programme, a series of papers upon culture of the grape, the first being from Mr. T. V. MUNSON of Denison Texas, upon

#### PROGRESSIVE GRAPE CULTURE FOR THE NORTH.

While the title of my paper is very much in appearance like "Progress in Grape Culture," and in treatment may be similar to what such a paper would naturally be, yet essentially the two subjects are very distinct. Progress in grape culture would be essentially historical, while progressive grape culture must be prospective, theoretical, prophetic, a judgment of what may or will be done, based upon a knowledge of what exists, out of

what it came, and the capabilities of variation and adaptability of the material in hand.

You will not expect me to treat the subject in an unlimited sense. That would take a large book and include the world. I shall confine myself to the northern part of the United States, if not exclusively to Michigan, as most interesting and profitable to my audience, but I shall take occasion to lift the curtain a moment upon the stage of other sections, as the products of such are bound to have some bearing upon your region in the matter of marketing.

I imagine I see many of you smile at my presumption — a Texan trying to tell Michigan horticulturists how to progress in grape-growing!

From what I saw last June in the test vineyards of your worthy president, I am sure he can tell you far better than I. There is Mr. WOODRUFF of Ann Arbor, and many others in your midst, who have been carefully studying how, and trying, to progress in this matter; and, since I come to think of it, I fear I have made a great mistake by not trying to tell how we are progressing in Texas, instead.

But your president has most courteously invited me to send you a paper on grapes, and, as I don't expect most of you to move to Texas to take advantage of our progress, but that you wish to have an outside view of your work, I shall stick to my text, and thank you for any critical smiles, or remarks either, that my paper may draw.

#### SYNOPSIS OF AMERICAN SPECIES.

In the first place, let me present a synopsis of all the grape species of North America, including the *Vinifera* and some other old-world species for comparison. Then we shall see what of these are native of Michigan or near-by regions, and what ones enter into the varieties in cultivation in your vineyards; also what others can endure your climate and promise to enrich your list of varieties. Then, I think, you will be enabled to better appreciate in what direction you may look for progress in viticulture in your lovely lake regions.

You will perceive that I do not think much further progress will be made, so far as modes of training and cultivation of varieties now in existence is concerned, above what your best vine-growers have reached. The progress chiefly must lie in the development of new types of grape, which will give greater product, finer size and color; and, above all, purer, finer quality. How much does the best grape you grow in marketable quantities fall short in appearance and quality of the best *Vinifera* varieties, the Rose of Peru, Calabrian, Faher Zagos, Muscat of Alexandria, Black Hamburg, etc.! This difference, at least, is the measure of progress allotted to you, or there is no truth in the claims of evolution. That evolution may be brought about speedily by the most intelligent experimentation, or it may be delayed thousands of years, or forever, if the result is left to the "chance seedling in an old fence-row" method. Some would-be originators or discoverers appear to regard with a sacred reverence these chance improvements, while they scorn intelligent effort to produce new and better kinds, as akin to impiety. Nature has taught us that out of the original protoplasmic algæ of primeval times, millions of years gone by, have come gradually the myriad forms of life, flower, and fruit of our

planet, by simple action and interaction of the affinities and repulsions of the various materials of earth upon one another. Some products are sour, bitter, poisonous, hideous; some sweet, luscious, wholesome, beautiful. Experience has taught us that new combinations and new results are capable of being made *ad infinitum*, and that the very life of our civilization stands upon intelligent selection and breeding of animals and food-and-beauty-producing plants, cultivated among us, still further aided by mechanical and artistic invention.

We can truthfully say that were the inventors and originators stilled entirely, and all persons required to simply operate with what we have, and to seek for nothing new, that progress would at once cease, and decay would speedily follow, for the old would not be capable of meeting the new natural conditions ever unfolding.

By viewing the past and its products we can the better perceive in what way to point our experiments for best success in the future. Hence I present the most recent and thoroughly studied classification of natural specific grape productions, so that experimenters may the better join hands with Nature and entice her to give forth still more of sweetness, of refined aroma, of lusciousness, of healthful food, of purifying beauty, enabling still more people to live happily upon the same extent of land, so far as the grape enters the problem.

There are in North America, and nearly all of them in the United States, some twenty or more species of wild grape, and millions of varieties of each species, as no two wild vines bear identically the same kind of fruit, while in all the balance of the world besides there are only six or eight distinct species.

#### THE TWO SECTIONS OR SUB-GENERA.

The genus is composed of two sub-genera, namely:

*Section I.*, the true grapes, is botanically designated *Envitis*. This section comprises all vines having shreddy bark, shredding in flakes more or less, with tendrils forked and cluster in true *thyrses*—that is, where the central axis (*rachis*) has many subdivisions (*pedunclets*), all along the rachis, each pedunclet bearing a number of pedicles, each with a single minute flower at summit, followed by a berry. Some have the berries very small, others large; some ripen very early, others very late.

*Section II.*, the Muscadine or wartywood grapes, is botanically designated *Puncticulosis*. This group comprises all vines having warty, closely clinging, non-fibrous bark, with simple tendrils and clusters in cymes—that is where all the berries hang in nearly the same plane, and are few in number. It contains only two species, confined to the southern part of the United States, one of them extending into Mexico and Central America.

*Section I.* I divide into seven series of species, found in America, and there are two other series found in Asia.

All the species of section II are in one series.

## CLASSIFICATION OF GRAPE SPECIES.

Those numbered are native, those lettered are foreign.

## GENUS VITIS.

Section I. *Envitis*.

- |                                   |   |   |
|-----------------------------------|---|---|
| Series 1<br><i>Riparie.</i>       | { | 1. <i>Vitis rupestris</i> , Rock or Sand Grape, Tex., Indian Ter., Mo., Tenn.   |
|                                   |   | 2. " <i>Vulpina</i> , (Linnaeus) ( <i>Vitis riparia</i> , Michx), Riverside Grape.  |
|                                   |   | 3. " <i>Solonis</i> , Bush Grape, northwest, Texas.   |
|                                   |   | 4. " <i>Doaniana</i> , Doan's Grape, northwest, Texas.  |
| Series 2<br><i>Occidentales.</i>  | { | 5. <i>Vitis Arizonica</i> , Gulch Grape of Arizona, New Mexico, etc.  |
|                                   |   | 6. " <i>Girdiana</i> , southern California, Valley Grape.   |
|                                   |   | 7. " <i>Californica</i> , northern Cala., southern Ore., Valley Grape.  |
| Series 3<br><i>Coriaceae.</i>     | { | 8. <i>Vitis Champini</i> , chalky limestone hills, southwest Texas.   |
|                                   |   | 9. " <i>Candicans</i> , Mustang Grape, black lands of Texas.  |
|                                   |   | 10. " <i>Coriacea</i> , Leather-Leaf Grape, Florida.  |
| Series 4<br><i>Labruscae</i>      | { | 11. <i>Vitis Labrusca</i> , Northern Muscadine Grape, Atlantic states, south-<br>Indiana, Kentucky, Tennessee.                  |
| Series A<br><i>Labruscoideae.</i> | { | a. <i>Vitis Coignetia</i> , northeast China, Isle of Jesso, Japan.  |
|                                   |   | b. " <i>Romaneti</i> or <i>Davidii</i> , China.   |
|                                   |   | c. <i>Vitis Vinifera</i> , { Southwest Asia furnishes the varieties chiefly in<br>cultivation in Asia, Europe, California, etc. |
|                                   |   | d. " <i>Bourguiniana</i> , { southern Europe, "Southern Æstivalis<br>Group,"  |
| Series 5<br><i>Æstivales.</i>     | { | 12. " <i>Lincecumii</i> of southeast Texas. Typical form.   |
|                                   |   | 12 b. " <i>Lincecumii</i> { <i>Var. glauca</i> , "Post Oak Grape" of northern<br>Texas, Indian Ter., Ark., and S. Missouri.     |
|                                   |   | 13. " <i>Bicolor</i> , { Ill., S. Wis., S. Mich., Ind., Ohio, Ky., N. Y., Pa.<br>Northern form of Æstivalis, "Blue Grape."      |
|                                   |   | 14. " <i>Æstivalis</i> , { Virginia, Carolina, Georgia, Tenn., Ala., Miss.<br>"Summer" or "Coon" grape of those states.         |
|                                   |   | 15. " <i>Simpsoni</i> , Florida, Palmetto-Leaved Grape.   |
| Series 6<br><i>Cordifolia.</i>    | { | 16. <i>Vitis Cordifolia</i> , { "Frost Grape" from Kansas and cen. Texas east<br>to Atlantic and north from Gulf to about 40°.  |
|                                   |   | 17. " <i>Rubra</i> , river bottoms of southern Illinois.  |
|                                   |   | 18. " <i>Monticola</i> , chalky limestone hills of southwest Texas.   |
| Series 7<br><i>Cinerascentes.</i> | { | 19. <i>Vitis Baileyana</i> , "Possum Grape" of sw. Va., W. Va., and w N. C.   |
|                                   |   | 20. " <i>Berlandieri</i> , chalky limestone hills southwest Texas.  |
|                                   |   | 21. " <i>Cinerea</i> , { Sweet Winter Grape, nearly same range with<br><i>Vitis cordifolia</i> .                                |
|                                   |   | 22. " <i>Caribaea</i> , West Indies, Yucatan, eastern Mexico.   |
|                                   |   | 23. " <i>Blancoii</i> , western Mexico, in Sierra Madre mountains.  |
|                                   |   | e. " <i>Lanata</i> , China, the hardier foreign species.  |
| Series B<br><i>Heterophylla.</i>  | { | f. <i>Vitis Pagnucci</i> , southern China, more or less divided leaves.   |
|                                   |   | g. " <i>Thunbergii</i> , southern China, more or less divided leaves.   |
|                                   |   | h. " <i>Heterophylla</i> , s China and India, more or less divided leaves.  |

Section II. *Puncticulosis*.

- |  |   |  |
|--|---|--|
| Series 8<br><i>Chiri Simpleses</i> ,<br>Simple tendrils. | { | 24. <i>Vitis Rotundifolia</i> , { "Southern Muscadine Grape," Austin, Texas,<br>east to Atlantic.  |
|  |   | 25. " <i>Munsoniana</i> , { "Bird Grape," "Everbearing Grape, south-<br>ern Florida and Florida Key, only species<br>reported from the Florida Keys. |

Thus you see how nature has, in the long ages, thrown off this goodly branch of variations from that great and curious order, *Ampelidae*, to which belong the beautiful genera of *Cissus*, *Ampelopsis*, *Parthenocissus*, and that wonderful tuberous-rooted, rich-fruited genus, *Ampelocissus*, which has over forty species in Africa and many others in India, Australia, and Mexico, all tropical; much as nature would say to man, "See what I, groping in a chance like way, have molded out of the crude elements! Now take hold with the intellect I have developed in you, and push forward the variation and elevation to your every need and comfort, from the dead and senseless to the live and infinitely enjoyable, remembering, too, that you also inherit from me this evolutionary tendency. So do not fail to practice upon yourselves the same beneficent principles that you know work such vast benefit to inferior animals and plants."

With this injunction, written all over and through your lovely country among the lakes, hills, forests, and vines, let us see what this bountiful nature has left you here to make your vine, and I then shall withdraw, that some one else may show you your fig tree and how to better adapt it to your climate and needs.

#### THE NORTHERN TYPES.

When we come to look over the list, behold! how poor you are in wild grapes, in comparison with our great Texas! Yonder, on your warm, sunny sand-hills, among the oaks, climb your *Vitis bicolor*, with small, compact, cylindrical clusters, reminding one of ears of pop-corn; and down there in the valley, along the creeks and rivers, and around the margins of your charming little, and deep-blue mammoth, lakes are nestled, along your fences and over low bushes, the small, early *Vitis vulpina*. It is now certainly known that this is Linnæus' long lost *Vitis vulpina*, that has been applied to our southern *Vitis rotundifolia* and others (more generally known as *Vitis riparia*), and they are all you have! But trial has proven *Vitis Labrusca*, in nearly all its cultivated varieties, foremost of which is Concord, to find a genial home here.

Not only that the various hybrids of *Labrusca*, with *Vinifera*, and of your native *Vulpina* with *Labrusca*, such as the Clinton family, do as well here as anywhere. Even the Delaware, a hybrid between *Labrusca* and what appears to be some form of *Vitis Bourquiniana*, succeeds well, but for the downy mildew. That also is the enemy of the hybrid with *Vitis vinifera*.

#### VARIETIES DEVELOPED IN MICHIGAN.

A hybrid of the wild *vitis Labrusca* and *vitis cordifolia*, from the mildew regions of Virginia, has given me some second hybrids or crosses, with Delaware and Jefferson, of fine quality and beauty. One such, named Roanoke Red, placed in the hands of a friend, HENRY PURFIELD of Ann Arbor, your state, last summer passed unscathed by mildew, while even the natives in the vicinity lost their foliage, and the vine appears perfectly hardy there, ripening its wood perfectly. I regard the quality of the fruit equal to that of Iona, of the size of Ives. But it is very late, later even than Catawba. Another season will tell whether your season will ripen it or not.

THIRTY-FIVE OF T. V. MUNSON'S BEST GRAPE.

T. V. Munson's variety No.	Name and specific blood of variety.	Date of leafing out.	Date of shedding foliage.	Date of flowering at Denison, Texas.	Growth.	Diseases.			Hardi- hood.		Fruit.						Cutting root.	Region for which recom- mended.					
						Downy mildew.	Anthracnose.	Black rot.	In cold.	Heat and drought.	Cluster.		Berry.		Seed.				Quality.				
											Size.	Shape.	Size.	Color.	Number.	Skin.			Pulp.	Juice color.	Flavor.	Productiveness.	
23	BRILLIANT— Lindley x Delaware	m	e	5-4	m	o	o	1	1	2	1	cy sh	l	r	m	1-3	tn tf	j t	w	q	gt	1	N. S.
71	CAMPBELL— Triumph Seedling	m	e	5-8	w	o	o	1	2	3	1	cy	m	y	s	1-2	tn tf	mg	w	b	m	1	N. S.
44	EARLY WINE— Post Oak x Rupestris	m	m	5-7	v	o	o	1	1	2	m	cy	m	b	m	2-3	tn tf	j t	dr	vg	m	1	N. S.
21	BELL— Elvira x Delaware	e	1	5-3	v	o	o	o	1	1	m	cy	m	g	m	2-3	tn tf	t	w	vg	m	1	N. S.
55	ROEMEL— Elvira x Triumph	m	m	5-5	v	o	o	o	1	2	m	cy sh	m	w	s	1-3	tn t	mg	w	b	gt	1	N. S.
30	AMERICA— Post Oak x Rupestris	vl	vl	5-16	vv	o	o	o	1	1	1	cu sh	l	b	s	3-5	tn	mg	r	vg	gt	1	N. S.
201	R. W. MUNSON— Big Post Oak x Triumph	l	1	5-11	vv	o	o	1	2	1	1	cy	l	b	s	2-3	tn	t	r	vg	gt	2	N. S.
96	DR. COLLIER— Post Oak x Concord	l	1	5-10	v	o	o	o	1	1	1	cu	l	dr	m	2-4	tn tf	j t	r	g	gt	2	N. S.
202	DELICIOUS— Big Post Oak x Herbenont	l	vl	5-16	vv	o	o	1	2	1	1	cu	m	b	s	1-3	tn tf	mg	r	b	gt	2	N. S.
83	LINDHERBE— Lindley x Herbenont	l	vl	5-12	v	o	o	o	2	1	m	cy	m	r	s	1-3	tn tf	my	w	b	gt	2	N. S.
105	BIG EXTRA— Post Oak x Triumph	l	1	5-16	v	1	1	2	1	1	1	cy	l	b	m	2-4	tf	t	r	vg	vg	2	N. S.
196	BAILEY— Post Oak x Triumph	l	1	5-12	m	1	o	1	1	1	1	cy	l	b	m	2-3	tn tf	my	r	vg	vg	2	N. S.
66	OPAL— Lindley Seedling	l	m	5-9	v	o	o	o	1	1	2	sh	l	y	m	1-3	tn tf	j	w	vg	gt	1	N. S.
74	GOVERNOR ROSS— Triumph Seedling	vl	1	5-18	m	o	o	1	2	2	vl	cu	l	y	s	1-3	tn tf	mg	w	b	m	1	N. S.
129	CARMAN— Post Oak x Triumph	l	vl	5-14	vv	o	o	o	1	1	1	cu	l	b	s	2-3	tf	my	w	vg	vg	1	N. S.
81	HERMANN JAEGER— Post Oak x Herbenont	l	vl	5-12	vv	o	o	o	1	1	1	cy sh	m	b	s	1-3	tn tf	mg	r	vg	vg	2	N. S.
173	W. B. MUNSON— Post Oak x Triumph	m	1	5-14	v	1	o	1	2	1	1	cy	m	b	s	1-3	tn tf	jmg	r	b	vg	2	N. S.
126	ONDERDONK— Herbenont Seedling	vl	vl	5-18	vv	o	o	o	2	1	1	cu	s	w	s	1-3	tn tf	j	w	b	gt	2	N. S.

	1	v1	5-15	vv	o	o	o	2	1	vl	cn	s	b	s	2-3	tn tf	mg	r	b	vg	3	S
72 BLACK HERBEMONT— Herbomont Seedling																						
198 NEWMAN— Big Post Oak x Triumph	m	vl	5-16	v	o	o	1	2	1	vl	cn	vl	b	s	2-4	tn tf	j t	r	vg	gt	2	S
145 ADMIRABLE— V. Linecumii x V. East.	vl	v	5-18	vv	o	o	o	1	1	1	cn	m	b	s	1-4	tn tf	my	r	b	vg	3	S
183 Big Hope— Post Oak x Triumph	1	1	5-15	v	o	o	1	1	1	vl	cy db	m	dr	s	2-3	tn tf	t	pr	vg	vg	2	N. S
218 Mrs. MUNSON— Neesho x Herbomont	1	vl	5-17	vv	o	o	1	2	1	1	cn sh	s-m	pur	s	1-3	tn tf	mg	w	b	vg	3	S
160 Perry— Post Oak x Herbomont	1	vl	5-18	vv	o	o	2	2	1	1	cn	s-m	pur	s	1-3	tn tf	mg	w	b	vg	4	S-W
217 MUNSON— Neesho x Herbomont	1	vl	5-16	vv	o	o	1	2	1	1	cn	s-m	pur	s	1-3	tn tf	mg	w	b	vg	3	S
151 Hopkins— Post Oak x Cynthia.	vl	vl	5-19	vv	o	o	o	1	1	vl	cn	m	b	s	2-4	tn tf	my	r	vg	vg	3-4	N. S
75 GOLD CORN— Cynthia x Martha.	1	1	5-12	v	o	o	o	1	1	m	cy	1	y	s	1-3	tn tf	j	w	vg	vg	3	N. S
18 ELATGAND— Elvira x Mustang	vl	vl	5-5	vv	o	o	o	2	1	s	sh	1	dr	m	3-4	tn tf	t	r	g	gt	2	S
159 OROLE— Post Oak x Devereux	vl	vl	5-17	v	o	o	o	2	1	1	cy sh	s	b	s	1-3	tn tf	t	r	b	gt	3	S
165 VIRITA— Post Oak x Herbomont	1	vl	5-18	vv	o	o	o	2	1	1	cn sh	s-m	pur	s	1-3	tn tf	jmg	w	b	vg	4	S
212 NEVA MUNSON— Neesho x Herbomont	vl	vl	5-21	vv	o	o	o	2	1	1	cy sh	s	pur	s	1-3	tn tf	t	r	b	vg	4	S
76 PERNS MUNSON— Post Oak x Triumph	1	vl	5-19	vv	o	o	1	1	1	1	cn	1	b	s	1-3	tn	j t	r	b	gt	2	N. S
120 RAGAN— Post Oak x Triumph	m	vl	5-16	vv	o	o	1	1	1	1	cn	m	b	s	2-4	tn	jmg	r	vg	gt	2	N. S
153 MARGUERITE— Post Oak x Herbomont	1	vl	5-21	vv	o	o	o	2	1	m	cy	m	pur	s	1-3	tn tf	jmg	w	b	gt	3	S
112 LAUSSEL— Post Oak x Gold Coin.	vl	vl	5-17	vv	o	o	o	1	1	1	m	g sh	b	s	2-4	tn tf	j t	r	vg	gt	4	S

## Explanation of Table:

1. Immediately below each name is given its specific blood. The mother species is always named first and is joined by x to the male parent.

2. All of the varieties in this list have perfect flowers, and will bear well standing alone.

3. The date of leaving out and the date of shedding foliage is indicated by: e—early; m—medium; l—late; vl—very late.

4. The date of having well commenced flowering at Denison, Texas, is indicated by the numerical dates, thus: 5-3—May 5th; 5-15—May 15th.

5. Growth: w—weak; m—medium; v—vigorous; vv—very vigorous.

6. Diseases: Downy mildew, anthracnose and black rot. 0—free; 1—slight attack; 2—severe. All of these varieties are resistant to Phylloxera.

7. Hardiness: In cold, 1—perfect, enduring 26° to 25° below zero in Missouri; 2—tender in bud at 5° below zero, but hardly in vine; 3—damaged partly in vine at 10° below zero. In heat and drought, 1—perfect throughout Texas, in best soil; 2—perfect at Denison, Texas, but less enduring than 1; 3—suffers more or less in thin soils at Denison.

8. Fruit: Size of cluster, berry and seed is indicated as follows: s—small; m—medium; l—large; vl—very large. Shape of cluster: cy—cylindrical; cn—conical; sh—shouldered; cn+compound; db—double. Color of berry and juice: b—black; r—red; pr—pale red; dr—dark red; pur—purple; w—white; y—yellow; g—green; r—(italic)—intensity of coloring matter. Number in seeds column—average number of seeds. Quality of skin: tn—thin; tk—thick; t—tender; tf—tough. Quality of pulp: t—tender; tf—tough; my—meaty; mg—melting; j—juicy. Quality of flavor: g—good; vg—very good; b—best. Productiveness of fruit: vgt—very great; gt—great; m—moderate; e—slightly.

9. Cuttings root: 1—easily; 2—fairly; 3—poorly; 4—with difficulty.

10. Region for which recommended: N—North; S—South. When in italics—especially for that locality.

11. This list is very full and comprehensive in description, although so compact. By careful use of the key anyone can select varieties suitable for any purpose, season, or locality where grapes can be grown.

By using the above key and writing descriptions below out in full, one can far better comprehend how excellent are most of these varieties.

In the South, with the old varieties generally in use, our grape crop passes away almost entirely in July and early August. This list gives a succession here at Denison from July 1st to October 1st. Beginning with brilliant we soon have Komel, then Carnish, Hermann Jaeger, etc., etc., in succession through August, with Laussel and others near the end of the list in September, keeping well on the vines till October.

You have in Mr. WOODRUFF of Ann Arbor a pioneer who has given your state a treasure in his large early Red, and some other kinds. He has found native vines of *vitis vulpina* ripening quite a good fruit considerably ahead of Champion. Such vines afford a starting point which with proper blending with such as Woodruff Red and Colerian and Early Ohio and Roanoke Red, may give your vineyards specific character, and much more value, in time, than any of the old varieties can. Vinifera blood must be much attenuated in your climate. It seems to me that all you want of that you have in as good form as you can get, in such as Rogers' best hybrids, Jefferson, Brighton, Moore's Diamond, etc.

The extensive tests in the station of your worthy president should be valuable study for your experimenters as well as market vineyardists.

While we have in the south a world of material for giving us fine grapes from June 15 until October 1, after that is all our fall and winter, when we consume imported grapes, either from the northern states, from cold storage, from California, or from Spain or from Sicily. So, after you have supplied your near-by markets, the south opens a vast region for the consumption of your best shipping grapes, kept in cold storage until after October 1. In time the south will overcome this deficiency at home, yet it will be some years, and we must have our fresh grapes as well as apples, for we are great fruit-eaters, as warm climate people should be.

#### MR. MUNSON'S OWN WORK AS AN ORIGINATOR.

I append to this a list of some thirty-five varieties produced by myself, selected from among many thousands. (See pages 118 and 119). It will be seen that, while I have done some work with a view to get varieties suited to middle and northern regions, yet the most are for the south, and some especially for the dry, hot, long summer of southwest Texas. The varieties are meeting with success in places where tested, showing that the theory on which I work is not far out of the way.

#### GRAND POSSIBILITIES.

Thus, you see, the field of development is unlimited. Both your species, in the best selections, to start with, in the hands of intelligent breeders, have valuable qualities that can undoubtedly be embodied in very fine grapes. Now is the time for such persons to hunt out these gems of nature, for rapidly the country is cleared off and the wild vines destroyed.

Within the grape genus we have as much or more variation as in the plum genus, and ought to develop as great diversity in varieties by intermingling species as we have among the stone fruits.

Behold how, in the last few years, we have been enriched in plums by bringing in the best of *P. Americana*, *P. Chicasa*, *P. Pissardii* from Asia, and several other strains, giving us a foundation for still greater development in skillful hands.

Then what may we not expect in the grape genus, with more species, and with capabilities for greater variation and more numerous uses! The prospect should make many an enthusiastic experimenter.

Continuing the session, two more papers relating to grape culture were read, the first of which was the following, by Mr. C. ENGLE of Paw Paw:

#### RAISING SEEDLING GRAPES.

The best way I have found to prepare the seeds for planting is to squeeze the pulp into a vessel and let it stand a week or longer, until the pulp decomposes. The seeds can then be easily separated by washing. An old pan with holes punctured in the bottom is as good as anything to keep the seeds in through the winter. I first put an inch or two of sand, then the seeds, and fill up to the top with sand. The pan is then sunk even with the surface, in the garden or some place where it will not be disturbed and can get the winter's freezing.

In the spring the seeds are sown in broad drills, one inch in depth, in ground previously made very rich with thoroughly rotted barnyard manure. After the seeds are sown I give a light dressing of unleached ashes with a little plaster added.

After they come up they are kept free from weeds, and the ground frequently stirred, and treated in every way as a row of garden vegetables should be to get the best results. Treated in this way, by fall a large share of the little vines will be large enough to plant out in the testing ground. Many of them will be a quarter of an inch or more in diameter just below the crown, with the top eight inches to a foot in length. I dig them in the fall and heel in quite deeply and set out in the spring.

With good care quite a percentage show fruit the third season, while others will be four, five, and even six years coming into bearing. So far, the better grapes are, with me, the most tardy in fruiting. Whether it is a uniform rule I have not lived long enough to find out.

#### BEST VARIETY FOR SEEDLINGS.

What variety shall we plant seeds from? Twenty years ago I raised 100 plants from Concord seeds, and since perhaps as many more, none of which were of any value. About fifteen years ago I commenced planting seeds from Rogers' hybrids, principally from Salem, with some Wilders and Merrimacks, also enough seeds from Ives to grow fifty plants. Two of the latter were an improvement on that variety. One peculiarity about these plants was their close resemblance to their parent and to each other. The closest observation could hardly detect the least difference in the leaf or habits of growth. They could easily be taken for plants grown from cuttings of Ives. The fruit was all black. Plants from seeds of Wilder, Merrimack, and Salem are very robust and strong growers, and from these I have produced the most promising fruit, especially from Salem. As much as ten per cent. are really good grapes; and of 500 seedlings, seven will rank for quality as near best as any I have ever eaten. Tested by myself and others, with Brighton and Moore's Diamond growing side by side, they have been uniformly pronounced equal to Brighton and much better than Diamond. The fruit is white, black, and the various shades of red, the latter color predominating. Wilder and Merrimack produce plants very similar to Salem. In the coloring of the fruit, black predominates.

## WHAT PROFITS IT?

Some ask, why do you spend so much time, labor, and thought in growing seedlings, when we have so many good grapes already? For the simple reason that I believe we can and will have much better ones; and it is not in the nature of man to be satisfied with even a good thing, if a better is attainable. From results of the little experimenting I have done, I firmly believe that the near future will see grapes as much superior to those now grown as the latter are superior to the Isabella and Clinton of the past. He would be venturesome indeed who would set a limit to the possibilities of improvement in the grape.

Is there any money in it? Well, that depends. If you get the longest-size horn, and have plenty of wind with which to work it, you may make some money. In that case it makes very little difference whether the fruit is good or worthless; as witness, the Russian mulberry, Mariana plum, Champion grape, and many others that are now being pushed.

## PROFIT NOT THE ONLY REWARD.

Some one has said that he who produces a valuable new fruit is a benefactor to his race. I don't think I was a born philanthropist, and education has taken from me what little nature may have first given. But I love the work. It is the most interesting—that isn't the word—fascinating, of any work I have ever done. Daylight can not come soon enough, nor stay late enough, when I am doing this kind of work.

I have been growing seedlings of strawberries, currants, raspberries, blackberries, grapes, plums, and peaches for the past twenty years. I am now sixty, but expect to keep right on growing them until I am a hundred, if I should live that long. I shall never be satisfied until I see a grape as large in bunch and berry as Niagara or Eaton, productive as Concord, and as good or better in quality as Delaware or Brighton.

MR. LAWTON: I would ask Mr. ENGLE why he uses the Rogers grapes in getting his seedlings, and what success he has in introducing his new grapes?

MR. ENGLE: I have not tried to introduce them; I have followed the practice from love of it. I use the Rogers hybrids because I have found a greater proportion of good grapes to be produced by them.

MR. GLIDDEN spoke in high praise of Mr. ENGLE and his work, saying the main hindrance to introduction of his new fruits, and his lack of the fame which they would bring him, is his modesty. Mr. GLIDDEN renewed the query as to why the Rogers hybrids gave the larger percentage of good grapes; but Mr. ENGLE said he did not know the reason for the peculiar fact.

MR. CHIDESTER: The Rogers hybrids are not good grapes; therefore, why try to propagate from them?

MR. ENGLE: While this is true of the fruits, these grapes do not, on my grounds, show rot and mildew.

MR. LAWTON: We have found that Mr. ENGLE's grapes are better than those of Mr. WOODWORTH of Ann Arbor, none of the latter being good here.

MR. LEWS: Did this Mr. ENGLE originate the Engle's Mammoth peach?

MR. ENGLE: I suppose so.

MR. LAWTON: Yes; and the Susquehanna and other good ones.

[Privately, Mr. ENGLE denied the responsibility for the questionable addition of "mammoth" to the name of his really excellent peach.]

Prof. TAFT: No answer can be made to Mr. GLIDDEN's question, save that Mr. ENGLE has tried it and found it so.

MR. MORRILL: As our good president has said, I am quite inclined to view things from the commercial standpoint. So I ask Mr. ENGLE if he has found a grape equal to the Concord for market.

MR. ENGLE: I can not say; but I have a dozen or fifty which I prefer for myself or to give to my friends. I do not know that there is any grape I would prefer to the Concord to set for market. I may have some; I think I have; but it will require more than my own grounds or my own lifetime to determine if any of them are preferable.

Following this discussion, Mr. C. P. CHIDESTER of Battle Creek presented the following paper:

#### GRAPE CULTURE.

What I shall say will be from my own experience and calculated for those who are just beginning in grape-growing, and not to your veteran vine-growers, many of whom have had greater experience than myself; and I am firmly impressed with the belief that I run some risk of telling you many things which you already know. Yet, you should remember that what we need most is line upon line and precept upon precept, to have these truths indelibly impressed upon our memories, in order to be successful.

#### WHERE TO PLACE A VINEYARD.

The location for a vineyard, in my estimation, having the greatest advantages, would be a high elevation sloping gradually to the east, from the fact that the snow does not blow off and thus leave the vines exposed to so great an extent as from a south or western slope. It seems to be an established fact that our prevailing winds during winter are from the southwest. Taking this fact into consideration, it would appear to be evident that the hybrids or half-hardy varieties of grape would be much more liable to winter-killing if placed upon the western hillsides. The high elevation of the vineyard prevents to a good degree the liability of injury to the grapes by early frost. We should remember that very much of the success or failure of the grape-grower depends upon his wisdom in locating his vineyard.

So far as my observation goes, a rather heavy loam, with a clay sub-soil, has proved most suitable for most varieties. I am firmly convinced of the fact that the soil has great effect, not only upon the health, but also upon the productiveness and quality of the fruit. It hardly seems necessary for me to suggest that whenever the soil is found to be lacking in fertility, a liberal amount of bone meal or wood ashes should be applied.

#### POSITION IN THE VINEYARD.

There is probably no question upon which vineyardists differ to so great an extent as upon the distance grapevines should be set apart. Of all distances that I have tried and seen tried, I have never found any more satisfactory than twelve by sixteen feet. The advantages over a less distance are, more sunlight and better circulation of air, thus causing the vines to dry more quickly after rain, thus preventing mildew and rot to some extent. It also gives plenty of room to cultivate with team, also for raking of cuttings out from between the rows with horse-rake. This distance also gives plenty of room to drive horse and cart with spraying machine.

Whether the vineyard is set upon the eastern or western hillside, set your vines sixteen feet apart in rows running north and south. This will prevent to a great degree the washing by heavy rains. This also gives both sides of the row an equal benefit from the rays of the sun.

#### PRUNING IN BRIEF.

I would say, in regard to pruning, that I have no fine-spun theories to offer. This subject has been so often treated by our best vineyardists that I do not deem it wise to occupy much of your valuable time. At the time of planting I generally trim off all but two buds. I prune again in November, down to about three and one half feet. In the spring the two upper buds are allowed to grow, all others being pruned off, thus leaving two canes to grow upon each one of the previous year's growths. Each vine should be trained to wires which are placed upon posts, about fifteen inches apart, the top vine to be placed nearly to the top of the post. The posts should be about six feet above the ground. These vines are allowed to run eight feet each way. After the length of the vine is established, I usually prune in November, leaving two strong buds upon each branch of the present year's growth, for the bearing wood for the next season.

I do not wish to be understood, by what I have said, that I favor summer pruning; that is, the breaking off of the ends of vines or leaves after the grapes have formed. I have never seen any good results from such pruning. What I recommend is, thinning out after the vine has made a growth of three or four inches.

About the first of June, or when the vines have made a growth of about three inches, I go through the vineyard and break off all weak sprouts, leaving only the strongest ones which contain the largest clusters. If to any one thing more than another I am indebted for my success in growing grapes, it is to the proper thinning in the month of June.

#### HYGIENIC WORK IN THE VINEYARD.

To have abundant crops of grapes we must have healthy vines. The experience of the last few years has demonstrated the fact that, in order

to have healthy vines, we must protect them, not only from the many fungous diseases, but also from the ever increasing insect pests which now threaten their entire destruction. The use of the Bordeaux mixture in connection with the arsenites has proved so wonderfully effective in combatting these enemies of the vine that it seems almost superfluous to mention it in this connection.

I would simply say, to those who have had no experience, that the formula which contains four pounds of sulphate of copper, four pounds of stone lime to which is added fifty gallons of water, has proved very satisfactory in preventing the black-rot upon the vines and grapes. For the destruction of insects it will be necessary to add one fourth pound of Paris green or London purple to the above mixture. I used the above preparation upon my plum trees the past season and it proved an efficient remedy against the curculio. Many cases were noted where plums had been stung several times without the least apparent injury.

#### VARIETIES FOR MICHIGAN.

If I should be asked to name a list of varieties for Michigan, from among the old varieties, my choice would be for the white, Colerain, Moore's Diamond, and Niagara; for the black, Moore's Early, Worden, and Concord. With regard to the newer varieties, I can not speak from actual experience, only so far as my own seedlings are concerned, two varieties of which I have placed upon exhibition, hoping that they will receive your impartial verdict.

#### AS TO THE FUTURE.

The question might properly be asked, what are our prospects in the future? Reports have come from all our grape-growing districts, stating that grapes were sold during the past season much below cost in many instances. I saw large quantities of Concord grapes sold in Battle Creek the past season for one cent per pound. How are we going to obtain better prices in the future? Simply by raising better varieties that can be put into the market either before or after the Concords are out of the way. It seems to me that new varieties of grape, which shall be superior in many respects to our best old varieties, would be valuable acquisitions. Although we have made rapid advancement during the last fifty years, perfection has not been reached. I have no doubt, from present indications, that our hopes will be realized in the near future. Let us take new courage from our past achievements and persevere until success crowns our efforts.

#### SPRAYING MIXTURE.

Take four pounds sulphate of copper and four pounds stone lime; mix the lime with fifty gallons of water; pulverize and dissolve the copper sulphate and put it into a barrel; fill it half full of water. In another vessel slake the four pounds of lime in four or six gallons of water. Pour the lime water slowly into the barrel, straining it through some coarse canvass. If you wish to apply this as an insecticide, add one fourth pound of Paris green or London purple, after which add the remainder of the water.

Mr. CHIDESTER made a demonstration of his method of pruning. He grows two canes and trains them eight feet each. These are cut back to two buds each season, and the fruit and new growth so controlled as to give free air circulation. Here at Lawton, he said, he found very long branches, four or five buds being left for each season's growth, which causes the branches bearing fruit to drop together, entirely covering the fruit on the lower canes. He uses two wires, sixteen inches apart, the upper one six feet from the ground; rows twelve feet apart, and grows about seventy-five pounds of fruit per vine when so much can be obtained. He would not set vines closer than this.

The third paper upon the general subject of grape-culture, was by Mr. WM. A. SMITH of Benton Harbor, and was read by the secretary:

#### GRAPE CULTURE IS OF WANING INTEREST.

I think the subject of grape culture, at this meeting, will have more than its due share of consideration. When veteran horticulturists are summoned from Texas, New York, and all along this shore (myself omitted), to teach our friends at Lawton how to grow grapes, it looks a good deal like carrying coal to Newcastle, or sand to the Sahara. They have "caught on" to this business with a full flush, and we will do well if we follow in their wake. Why, from the reports of their shipments for a year or two past, they will soon have to have additional railway facilities and special rail service to carry their fruit to market.

Again, the matter of grape culture is no longer a mystery. Any novice, if he has energy enough to yawn before sunrise, can succeed if he will. The evidence of this fact is seen every year by the almost unlimited amount of this fruit in all our principal markets, and the small markets are by no means neglected. I know of no fruit that will respond more readily and liberally than the grape. It will grow and flourish in any soil that is dry enough, and mature in any climate that has heat and sunshine enough. Like the peach, it is a warm-blood fruit and must have plenty of air and sunshine. In cultivating the grape for commercial purposes where labor is high and land is valuable, the utmost economy is necessary in order to make both ends meet. It takes but a few years to start a vineyard and have it in bearing condition; and, when once in bearing, it may be kept so for a generation or two, or longer, by proper usage and care, and, withal, requires perhaps less fertilizing to grow good crops than any of our native fruits. The fruit itself is nearly all water or fluid, and hence does not exhaust the soil like many other fruits. Old vines, if desirable and valuable, may, if circumstances require, be removed, even after having been in full bearing for a dozen years or more, to a new location, by proper root-pruning and cutting back, and brought into full bearing in two or three years. I have harvested good crops of Delawares the second year after transplanting, yet the Delaware is not a strong grower.

## SOIL-CULTURAL METHODS.

The soil for the grape should be dry and high, free from surplus stagnant water, and having full exposure to sun and wind. Air drainage is essential as well as water drainage. Different varieties of grape, to do well, require different soils, or at least higher or lower fertility. Grapes like the Concord, Niagara, and others of that class, will do well on any ordinary soil, while the Delaware requires higher culture and stronger and better soil to do well. The Diana is such a rampant grower that nothing but a light soil will induce it to fruit well.

Aside from the ordinary farming tools, but few special tools are required in the vineyard. Among these a good pruning shear and wire stretcher are essential.

In trellising the grape, two systems are adopted, viz.: the horizontal and upright. It is a mere matter of fancy which one we adopt. The upright will afford more room for cultivating the ground, while the horizontal will give better leaf shade and shelter to the fruit. In the former, two wires are sufficient, while in the latter three are often used, No. 10 galvanized wire is cheaper in the end and better than the black wire.

Bagging the grape has never been practiced to any great extent in Michigan, and I doubt if it will be, at least in the near future. Unless some greater calamity than any in the past overtakes this fruit, we will permit grapes to blush and ripen in the wind and sunshine, without any extra covering. At the present rate of supply and demand, any additional expense would be burdensome. The margin now is so small that the utmost economy must be practiced in order to make the business a success.

## SOME OF OUR DISADVANTAGES.

We in Michigan are placed between two fires. California and New York contend for our western markets. The California fruit does not interfere so much with ours as the eastern fruit, because the former is of a different character and partakes more of the fancy order in appearance, yet greatly inferior in quality, while the eastern is the same in kind and quantity, and has equal if not superior facilities for reaching our home markets. There is no reason why they will not fill our markets in the future as they have in the past.

With us winter protection from low temperature, is hardly a supposable contingency. The other extreme not unfrequently happens, a high temperature when it should be low. Sixty degrees above, in midwinter, makes the fruitgrower wish the summer was further away. December 24, 1893, the thermometer marked 62°.

## PRUNING.

In pruning the grape, no specific rules can be given that will be satisfactory to a beginner. Judgment and practical experience alone can furnish a correct guide. It is safe to say that the great majority of pruners leave too much wood. The fruit is crowded too much on the vines, does not receive air and sunshine enough for well-developed and well-ripened fruit. Only wood enough should be left to fill the trellis, and the bearing

canes cut back to two eyes. These vines should be evenly distributed on the trellis.

Whether we grow fruit for our own use or somebody's else use, there need not necessarily be any difference in the manner of culture, nor yet in the variety cultivated. What is good for home use is equally good for others' use.

#### EARLY GRAPES THE MORE DESIRABLE FOR MICHIGAN.

The time of ripening is highly important in a commercial vineyard. Other things being equal, the early grape is the most desirable, as it is always in good demand. The Concord, as yet, is the grape for the million. The Worden may precede it in ripening, by a few days, but hardly difference enough to make it much of an object to substitute the one for the other. The Delaware always stands upon its merits and good quality, no matter whether it comes in the household or goes into market. Still, with all its good qualities, as well as being early, it hardly receives its due share of attention in our markets. The Brighton, though good in quality, will hardly prove profitable as a market grape. The foliage, growth of wood, and fruiting qualities of the Niagara are all that can be desired in any grape. Moreover, the clusters are large, handsome, and well-shaped. Yet it fails to be a popular fruit in our western markets. If the habit of specking, as the old Catawba used to do, becomes general, being a light-colored grape, it will soon be discarded as a market fruit. As yet we have nothing in the line of grapes that can take the place, either for home use or market, of the Concord and Delaware, and these should be grown in the proportion of ten to one.

#### AS TO KEEPING GRAPES.

The practice of holding grapes beyond their ordinary season, in hope of realizing better returns, is a delusion. The demand for any fruit declines after its proper season, because other fruits become more plentiful and naturally take the place of the grape. For home use they may be put up as other fruit, in tin or glass, and be ready for use any time. Again, they may be put in shallow trays or baskets, lightly covered with grape leaves, paper, or other light material, and kept in dry, well-aired compartments, free from frost. In this inexpensive way, even the tender-skinned Concord can be kept till the holidays. The clusters should be carefully selected and handled, and none but well-ripened ones selected. The Diana, owing to its tough skin and later ripening, is one of our best keeping grapes, if not the best, and withal a good table grape. It succeeds well on a light soil and should receive more consideration than it does.

#### GIRDLING IS BAD—SPRAYING IS GOOD.

The practice of ringing or girdling the grapevine, or fruit trees, for whatever purpose, I believe to be to be entirely pernicious. Where we gain one point in one direction we lose two in another.

Spraying, where necessary, either for grape rot or other fungous disease, should be applied early and frequently. The material to be used, and its proper composition, are given in all our experiment station reports, and

need not be repeated here. I have never had occasion to spray my vines, consequently can not speak from experience.

The concluding paper of the series was the following, by Mr. W. F. BIRD of Ann Arbor:

The secretary, in putting me down for a paper on grape-growing, has kindly furnished some points that are of so much importance that I shall in the main confine myself to them.

Permit me, however, at the outset, to say that, although we live under the shadow of the institution that entitles our city to be called the "Athens of the west," we have not yet learned all there is to be known about this important subject. This may also serve as an apology for appearing before this enlightened body of grape-growers.

The catalogues tell us that any one can grow grapes, that it is as easy as growing corn, and any corn land will do for grapes, etc.

Perhaps so, if we admit that only about one in ten has ever learned to grow corn successfully.

#### HIS IDEA OF LOCATION.

As to a choice of soil for grapes, our views have had to change somewhat within a few years past. It was thought by many that a sandy or gravelly soil was the first choice, and clay the last. The rainless summers of the past few years have reversed all this, and clay now stands at the head. The ideal soil is a sandy loam with a clay subsoil. The next best is clay all the way down. Of course, it must be rolling or well drained.

One of my neighbors who has been very successful with grapes on gravelly slopes, lost a large share of his crop last year and the year before by drouth. This explodes the notion that it can not be too dry for grapes. And we may add that on the above soil no amount of cultivating or other coddling will take the place of the dews of heaven.

#### TRELLISING AND PRUNING.

But to come to the points indicated—

(1) "The preferable method of trellising, pruning, and training grapes for profit, in a commercial vineyard, and how varied and modified where winter protection is deemed necessary."

There are trellises many, from the broad earth, over which some allow their vines to crawl, to the tree tops, which they are often permitted to climb. But there is no profit in these extremes. There are only two forms that I would use. These combine the most common-sense and economy, and also produce the best results. The first is the Kniffin trellis, consisting of posts about five feet high supporting two wires about three and five feet from the ground.

The training and pruning on this trellis are simplicity itself. One cane is allowed to grow to the top wire; two arms are trained each way on the two wires, making four arms. All other growth on the upright cane is generally removed as it starts. Exceptions to this will occur when the arms fail to throw out shoots near the upright. In pruning, everything is

again cut away except four arms, care being taken to save those starting nearest the upright, unless they should be defective. From two to six buds are left on each arm, according to the age and vigor of the vine.

The upright is tied to the two wires. The end of each arm is also tied to the wire. No other tying or pruning is done during the summer. Where the vines hang down in the way, they may be thrown up on the wires.

The other trellis is called the horizontal, a sort of overhead Kniffin. Cross-bars two feet long are nailed on the tops of posts, about six feet high. Over these bars are stretched three wires, one at each end, the other in the center of the bars. Some use only two wires. The cane is carried to the wire and tied to it, and an arm tied to each wire as in the other trellis, and the pruning is the same.

Pruning and gathering the fruit is not so conveniently done on this trellis as on the Kniffin, but it has advantages also.

For laying down in winter, no system is more convenient than the Kniffin. The main cane, however, should be inclined from the perpendicular, to a considerable degree; then, when pruned and cut from the wires, it is already half laid down.

(2.) "What method of trellising, pruning, and training will produce the most desirable results for the home plantation?"

Where chickens are troublesome, the overhead trellis will be very desirable. It can also be made to look very beautiful. Some who have plenty of time may prefer the Fuller trellis, which looks very neat when well cared for. This consists of several (three to seven) wires, the lower one a foot and a half or two from the ground. The main cane is carried to the first wire and two arms trained on it. From these arms the growing shoots are carried straight up and tied to the wires above.

#### VARIETIES FOR THE COMMERCIAL VINEYARD.

(3.) "What varieties, and what proportion of each, will prove most profitable for a commercial vineyard?"

Where the Niagara succeeds, would plant as follows: 50 Moore's Early in 1,000; 200 Worden, 100 Brighton, 50 Delaware, 300 Concord, 300 Niagara. If longer-keeping varieties are wanted, substitute some Vergeennes or one of Rogers' hybrids, Agawam, Salem, or Lindley.

#### VARIETIES FOR THE FAMILY.

(4.) "Most desirable selection for a home and family vineyard, and the reasons for such selection."

The reason will be found in the tastes of the different members of the family, which should be consulted. In our family, for instance, my wife thinks the Brighton the poorest grape in the vineyard, and the Delaware the best, while other members think the Brighton among the best. A large proportion of the grapes used in a family are table grapes, and quality will naturally lead in the selection. But, as we want a supply from first to last, we may get in some that are only second-rate. For thirty vines I would name two Green Mountain or Winchell, one Moore's Early, four Worden, four Brighton, three Concord, four Delaware, four Niagara, three Lindley, three Mills; and if they will mature, two Iona or Catawba.

## METHODS OF KEEPING.

(5.) "Most successful method of keeping grapes, the best varieties for the purpose, and how long may such varieties be kept?"

Hard questions. I have never used ice; have kept grapes fairly well with dry, cool air, in a building made for the purpose, mostly above ground, but running into a hillside at one end. They are packed in baskets or boxes of all sizes, with layers of leaves between the layers of grapes, where more than eight or ten pounds are together. Of course a uniform size would be better. The best varieties are Rogers' hybrids, Agawam, Salem, and Lindley, Vergennes, Ulster and Mills. These keep with little loss until the holidays. The Mills I have kept until March. The Catawba should be counted in where it will mature.

I have been on the lookout for the ideal long-keeping grape for some time, but have not yet found it.

## GIRDLING—SPRAYING.

(6.) "Ringing grapevines to secure increased size of the fruit—its effect upon the vine, also upon the quality of the fruit; its advantages if any."

I think it has no special effect upon the vine, as it is cut off at pruning time, unless a large portion of the canes on one vine were girdled. Then it might be injurious. The fruit is reduced in quality, most decidedly. It hastens the maturity of the fruit a week or more, and increases the size of some varieties. This might be of advantage in northern latitudes and also for the purpose of display at early fairs, but it would seem unjust for such fruit to compete with that matured naturally.

(7.) "Spraying—material used, when applied, for what purpose, and the results to be anticipated."

I have been troubled very little with rot, but have used the Bordeaux mixture in connection with Paris green early in the season to prevent rot and mildew, and also to destroy the numerous insect pests that eat the foliage and sting the fruit. I have used the ammoniacal solution later in the season, for mildew, and in both cases with good results.

## MR. LYON'S IDEAS OF KEEPING GRAPES.

Mr. LYON, speaking of his exhibit of grapes, regretted that the quality of the show was not better; but the demand upon him for specimens for exhibit, and for other purposes, had been so great that the best were gone when he went to get a supply for this occasion. He spoke of the great need of growing better varieties for the family supply, and for prolonging the season of this delicious fruit. Iona is one of the most desirable of the native varieties, for keeping, and in other ways, except as to productiveness and strength of plant, but these defects may be overcome. Delaware may be kept till March, in a dry cellar. Uhlan is early, but keeps as well as Delaware. Amenia is large, of fine quality, and grows vigorously but mildews. Merrimac, Agawam, and Barry are also good

keepers. Especial attention was called to Diana. Though unfit to eat when first ripe, if kept till this time the foxy taste disappears and the quality becomes good. Jefferson is one of the very finest of grapes in quality, is productive, and is a first-rate keeper.

#### MANY VIEWS OF METHODS OF TRAINING.

Mr. BALCH: I have largely used the fan system of pruning, but it is not wholly satisfactory. Latterly I have used the Kniffin system. I train one vine straight to the top wire, carrying one arm each way, but renew the arms annually, or nearly so. I prune down to forty buds to each vine, and get as much fruit as does anybody. I find 12x12 feet the best distance for setting grapes, though many here set 8x8 or 8x10. A given amount of ground will grow only about so many grapes, no matter on how many vines they are placed. The loss of product from wide planting occurs only while the vines are young. The same number of buds on spurs of the main vine will produce more fruit than on laterals, which seem to break down in strength. It is hard to get good fruit on the lower wire, especially in damp seasons. I have tried having two vines instead of one, one being on each wire, and had better results, the division of sap occurring in the roots.

Mr. MORRILL said he had seen and heard of the use of tins here to keep off the cutworm. He had used wisps of wool to better purpose, at less cost and labor. The wool will not pack about the branch, but remain loose so that the worms can not crawl over it.

Mr. BATES: Can the vines be gotten to the trellises without staking?

Mr. BALCH: Some of our growers stake the vines for the first two years, but others leave them on the ground the same time and then put them to the wires direct.

Mr. A. H. SMITH: When I prune as Mr. CHIDESTER recommends, I find the new growth mostly at the ends of the canes, especially in the case of the Niagara. It is difficult to keep up a supply of wood further back.

Mr. CHIDESTER: Not if the vines are not allowed to grow more than eight feet.

Mr. SMITH: That requires summer pruning?

Mr. CHIDESTER: Yes, sometimes.

Mr. STEARNS: I have had the same difficulty Mr. SMITH complains of. Has the renewal system been practiced here—going back to near the ground for new canes every other year?

Mr. CHIDESTER: I have practiced this for twelve or fourteen years, and never have seen anything equal to it.

A member: All this will do if the vines are sixteen feet apart. What if they are 8x8?

Mr. CHIDESTER: Take out every other one. That is just what I had to do. I have little liking for the Rogers hybrids. There are very few localities where they can be successfully grown.

Mr. ENGLE: I have always practiced the renewal system, growing my grapes wholly on stakes.

Mr. STEARNS: How about quality by that process?

Mr. ENGLE: Like other people, I think my grapes are the very best. At any rate, I have been able to take more than my share of premiums. As to quantity, however, doubtless I get the less.

Mr. STEARNS urged the importance of producing fruit of the very best quality of its kind. We must have it if we expect to sell the product of our orchards and vineyards. An unpruned vine may bear much fruit, but it is sure to be of inferior quality and much later than the same variety in proper culture.

Mr. LAWTON: The renewal system as practiced by Mr. ENGLE is different from that of some others. It used to be usual to renew from the ground annually, but now this is done at the first wire. The main crop here is from the upper wire, the lower one being used chiefly for the production of new wood. We have vineyards which have been pruned on the spur system for twenty-five years, but they do not produce so much fruit as do those on the renewal system. Mr. CHIDESTER's vines are now new, but as they grow old there will be no growth except at the ends, and that will not afford enough wood for a crop. Those using this system here have to keep the arms very short.

Mr. CHIDESTER: I have vines pruned on this system, which are twelve to fourteen years old, and I will pay the fare of any one going to see them and being dissatisfied with their appearance.

Mr. TRACY: I have seen in New Jersey a good system of training. The trellis is made of posts and slats, the latter fastened diagonally from one post to the other, making a diamond shape with the post in the center of the diamond. Vines are set eight feet apart in the row, the rows twelve or sixteen feet apart. Each season two canes are renewed from the root and trained upon the post. The next season these are separated and laid to left and right upon the slats. They are cut away the next year and two new canes laid in their places:

Mr. STEARNS: I renew, using three or four canes from near the ground.

## CULTIVATION AND FERTILIZING.

Inquiry was made of Mr. STEARNS as to what fertilizer he uses. He replied that he never allows a particle of barnyard manure near the vines, but every three or four years gives them a dressing of salt and ashes, cultivating thoroughly, using cultivators mainly for this purpose, but sometimes plowing shallow, not over two inches. He uses all the ashes he can get, with salt, at the rate of 200 pounds per acre. The salt is used on very light soil, and for the purpose of helping preserve moisture in time of drouth. It is equally good on such soils for other fruits than the grape. He applies the salt very early, so soon as he can get upon the ground, being careful not to touch with it the trees or vines. The salt used is refuse salt obtained from Chicago, which contains more or less fertilizing substances. He had never known the use of salt to increase or cause mildew in damp seasons.

Mr. LAWTON asked Mr. STEARNS as to cultivation, the latter having once advocated deep plowing. "I favor shallow cultivation," said Mr. LAWTON.

Mr. STEARNS: I recollect the occasion referred to. My talk at that time concerned an old orchard, long uncultivated, and I said I would plow it even though I had to cut many of the roots. But, ordinarily, I would not disturb the roots if I could help it.

Mr. BARNARD of Illinois described the vineyard in his state already referred to by Mr. GARFIELD. The vines are on very light soil, a sand hill, in fact, set six feet apart in the row, the rows twelve to sixteen feet apart, the trellis of a single wire and on such poor poles as the vicinity afforded. But the owner has some secret of fertilizing by which he produces the very finest of grapes, such as command premiums wherever exhibited. He says, however, that he can not produce them for less than thirty cents per basket, and whenever he can not get that price he turns them into wine. He uses no barnyard manure whatever, and grows asparagus between the rows, sending the same to Chicago, where it ranks as the very best.

This closed the discussion, the hour for adjournment having arrived.

Messrs. LAWTON and LEWIS, of the committee to examine the finances as reported by the treasurer and secretary, reported the same correct in every respect.

*Thursday Evening Session.*

The evening of Thursday was devoted mainly to two important papers, the first by Dr. W. J. BEAL, on "Some important points in plant growth," the second by Prof. L. R. TAFT, on "Plant food, the supply and demand." Music was interspersed, and the evening passed most pleasantly to the very large audience present.

## SOME IMPORTANT POINTS IN PLANT GROWTH.

The following brief abstract of the illustrated paper is furnished by the author:

I might occupy an hour in showing the relations of botany to horticulture, but that was my theme once, before this society, and the substance of the essay has passed into print.

Here are a number of fine topics for consideration: Movements of plants; the fertilization of flowers by insects; parasitic fungi that injure farm crops; those that infest orchards; those that trouble ornamental plants; those that annoy the vegetable gardener; those that benefit us by infesting weeds; weeds and their extermination; grasses and other forage crops; bacteria or microbes; popular errors about plants, including spontaneous generation, vitality of seeds; does wheat turn to chess? planting in the moon, errors about crossing plants, errors about pith and about roots and the circulation of sap, potatoes mixing in the hill, flavoring watermelons on the vines.

## THE BEGINNINGS OF GROWTH.

Let us now see what the different parts of the higher plants of farm crops do, how it is all done, or the tools they work with. We will begin with the root of the matter. A kernel of wheat contains five small roots, which can be seen by a section before the wheat sprouts. The central one appears first, then one on each side of this, and later another on each side of the three. The tips of these roots, when carefully taken from sandy soil, will be found to be naked for about a quarter of an inch, back of which adhere numerous particles of soil held by fine root hairs. The root elongates only by the rapid multiplication and enlargement of cells, a very short distance back of the apex. The apex is a root cap and contains in the front portion some loose cells, or cells easily loosened, that secrete mucilage. These cells make a slippery path for the young root to penetrate; other cells take the places of those cast off or rubbed off in the progress of the root. This root tip is remarkably sensitive and readily turns away from pressure or any little thing in its path. In this way it turns here and there, finding the place of least resistance. The root hairs mostly perish in a week or two from the small rootlets and are never reproduced, but fresh hairs appear on new branchlets. In experimenting with sprouting corn and beans, placed over water, I find the roots do not always grow down,

but often in a horizontal position and rarely upward. In such place (in damp air) roots manifest a tendency to make one or more coils near the tip. Roots of squashes, dandelions, in fact of almost any of our cultivated plants, soon shorten after they have reached down or sidewise into the soil. It is queer that they should do so, but this act causes the roots to tighten on every side and hold the plant above the ground in an upright position, as wet ropes shorten and hold a mast firmly in its place. The main function of roots of our orchard and garden crops is to absorb (by the root hairs in most cases) water from the soil, and this water holds in solution small quantities of earthy matter, and some gases to a limited extent. The water taken is mostly known as hygroscopic water, and not stagnant nor free water; *i. e.*, the hairs absorb water that merely wets the surface of the particles of soil in which there are numerous irregular air spaces. The microbes in the bunches on clover roots enable them to get nitrogen, which the plant absorbs.

In autumn, when the leaves die, most or all of the smallest rootlets perish, and in spring a new supply is put forth when the buds spread out their leaves. Some roots above ground hold a plant fast to a tree or a wall.

#### STRUCTURE AND OFFICE OF LEAVES.

The green leaves and other green parts of our common plants are spread out to the sunshine and the air. The leaf of a beet and of many other plants has a layer of cells covering it above and below known as the epidermis. These cells, soon after they acquire their growth, contain air only, or but little other matter. They serve to protect the more delicate cells within from sudden changes of temperature and help retain the moisture which might otherwise escape too rapidly. In dry, hot climates, leaves exposed to the sun are covered with epidermal cells of extra thickness, and not unfrequently with two or more layers on the upper surface. In the shade or in more moist climates the epidermis is less firm in texture. On the lower side of most leaves, and sometimes also on the upper side, are large numbers of minute mouths, each consisting of two lips. In moist air the lips open and allow surplus water to evaporate from the plant, and in dry air they generally close to help retain moisture. On the surface of leaves there is often a glaucous or waxy substance which prevents the rain from penetrating the leaf. Water, to no appreciable extent, is absorbed by leaves. In a dry time a plant wilts because the roots fail to supply sufficient moisture, and on the approach of rain or moist air leaves revive, because the roots can supply them with an abundance of water. Inside the leaves, the cells contain protoplasm which is colored green by a minute portion of coloring matter known as chlorophyll. In these green cells take place some complicated changes, analagous to the digestion of food in the stomachs of the higher animals; also of breathing by lungs. Surplus water and oxygen escape through the small mouths, the stomata above referred to. The framework of the leaves contains what are called veins or nerves, for want of better names, although they do not perform the function of veins or nerves in animals. Leaves do their work of assimilation in the daytime. They wear out or become useless in one season or in less time; in some instances they endure for more than one year, in which case plants are termed evergreen. These leaves are usually

cast off, in case of trees, by a small joint, and drop to the ground, serving as a protection to the roots and bed for the tender seeds till the approach of spring.

The following table is from "How crops feed," by Professor Johnson of Yale:

TABULAR VIEW OF THE RELATIONS OF THE ATMOSPHERIC INGREDIENTS TO THE LIFE OF PLANTS.

Absorbed by plants.....	{	Oxygen, by roots, flowers, ripening fruit, and by all growing parts.
		Carbonic acid, by foliage and green parts, but only in the light.
		Ammonia, as carbonate, by foliage, probably at all times.
		Water, as liquid, through the roots.
		Nitrous acid... { United to ammonia, and dissolved in water
		Nitric acid... { through roots.
Not absorbed by plants. {	{	Ozone..... { Uncertain.
		Marsh gas.... {
Exhaled by plants.....	{	Nitrogen (in a free state).
		Water in a state of vapor.
		Oxygen -- { By foliage and green parts, but only in the light.
		Ozone (?) - {
		Marsh gas in traces by aquatic plants (?).
	{	Water, as vapor, from surface of plant at all times.
		Carbonic acid, from the growing parts at all times.

PECULIARITIES OF LEAVES OF GRASSES.

The leaves of grasses are marvelous structures and most admirably adapted for self-preservation and renewal when grown among grazing animals. After it becomes fairly started, the blade elongates by multiplication of cells just at the base, where it leaves the main stem. The tips may again and again be nipped off, but the blade continues to be pushed up by growth from below. I have a leaf of June grass, taken from a hedge where it was protected, that is five feet four inches long.

Again, in dry time, the leaves of June grass and leaves of many other kinds of grass, fold up lengthwise like closing the two halves of a long, narrow, open book. Near the mid-nerve on either side of the upper surface of the blade is a group of thin-walled epidermal cells extending deeply into the leaf its entire length. These cells are very sensitive, and with loss of moisture contract, causing the blade to close as above mentioned. When moistened, they expand, spreading upon the blade. The blades of orchard grass open and close in a similar manner, only the deep, thin-walled cells are limited to one narrow band just above the mid-nerve. Some leaves, like those of timothy and Indian corn, roll in from both edges like the two sides of a scroll. This is caused by numerous longitudinal strips of thin-walled cells on the upper side, all of which, acting together, in dry weather, roll the margins in instead of closing them in the manner mentioned for June grass and orchard grass. This closing of the blades in a dry time is a means of self protection to the plant as the surface directly exposed is reduced one half.

## THE CLOVER LEAVES.

The leaves of all clovers consist each of three leaflets raised on a stem. If eaten by animals, a new blade never reappears on the tip of the leaf-stem. Others from below on small branches take their places.

In very dry weather or in cool weather the three leaflets approach each other and bend over one another, huddling together. This has been popularly called the sleep of plants, but it can hardly well be called sleep in the sense that animals sleep. The movement is produced by the change of the water in some cells in a short, cellus-like enlargement just at the base of each leaflet. The advantage to the plant of the leaflets thus opening and closing is apparent. In the hot sun, less surface is exposed to injury, and in cool air the leaflets crowded together help prevent the escape of heat. They crowd together for the same reason that pigs crowd together, viz.: to keep each other warm. A large per cent. of the leaves of the pulse family, *Leguminosæ*, behave like the leaflets of clover.

## METHODS OF GROWTH.

The stems of plants serve to hold the roots and leaves together, as middlemen stand between producers and consumers. The stems and branches of our larger herbaceous plants, shrubs, and trees spread out and hold the leaves in suitable positions for their mutual benefit.

Materials in a liquid condition pass from one part of the plant to the other, but the explanation of the manner in which all this so-called "circulation of the sap" is accomplished is too complex for a popular lecture. In thin-walled, living cells the protoplasm may often be seen gliding about in each cell.

So far, we have understood that the plant grows by the multiplication and enlargement of cells, finally sending forth branches, each of which is essentially like every other branch on any given plant.

After being well established, it is the plan for our higher plants, under natural conditions, to reproduce themselves by seeds. In flowers there are male and female organs. In Indian corn the pollen on the tassels at the top of the stems is the male element, and the silk of the young ears sends each a thread down to a young kernel. In flowers of apples the stamens and pistils—male and female parts—are both in each flower, still these are more certain of successful union when bees or other insects work about them. Apples fail to set fruit, even when they blossom freely, because the pollen is not well developed, or because the upper part of the pistil is not perfect, or because wet weather at time of flowering prevents the effectual access of the pollen to the proper place. In other cases, bad weather or other cause favors the growth of some fungus which injures pistil or pollen, or both.

Plants are made of minute cells, most of which have extremely small holes through their walls. In living cells is found the protoplasm which goes from the older parts to the new. The old cells are dead, because the protoplasm has left with its life. The cells are to be considered the home of the protoplasm which moves from room to room, analogous to the inmates of a fine, large mansion.

The source of plant food, as can be seen above, consists mainly of water and gases, with a very small portion from the soil.

I have my students in botany make experiments. One student cuts off the top of a radish, weighing while fresh the top and the root separately; then both are dried in a hot oven, to learn that about ninety per cent. of the tops and ninety-five per cent. of the roots have evaporated. The student who experiments with grass finds usually that seventy-five to eighty per cent. evaporates on drying. Dried seeds contain fourteen to fifteen per cent. of water.

Protococcus is a minute, one-celled, green plant floating in water or found in wet places. This tiny plant has no roots, no leaves, no stem, no flowers, and yet reproduces its kind by cell-division. It absorbs, assimilates, grows, and multiplies, performing a great variety of work with a very simple apparatus. In a higher plant the work is divided, more like that in a large factory where each person has a certain part of the labor to perform.

#### MEANS OF DEFENSE OF PLANTS.

Plants are protected from animals in a great variety of ways: by offensive odor, by poison, by disagreeable taste, by prickles, stings, and thorns, by offensive hairs. Milky juice keeps insect borers from laying eggs in the stem, and ants from climbing to the flowers where they would eat the sweet nectar without paying for it by fertilizing each flower, as would be done by many insects which approach the flowers on the wing.

If good, old Doctor WATTS were yet alive and able to write verses, and should become a botanist of the modern style, he would no doubt revise some of his work, a portion of which would read in this way:

"How doth the little busy bee  
Improve each shining hour,  
By carrying pollen day by day  
To fertilize each flower."

This view is much less selfish than the original version, so far as the bee is concerned.

Three fourths of our commercial products are of plant origin, and furnish the bulk of our food and clothing and materials for buildings, and with these the botanist has to deal. To help in the economic portion of this work, we have agricultural colleges, experiment stations, botanic gardens, explorations by botanists, agricultural and horticultural conventions and societies, numerous publications by the press, and museums and great expositions.

#### PLANT FOOD, THE SUPPLY AND DEMAND.

This was the title of the subjoined paper, by Prof. L. R. TAFT of the Agricultural college:

We are all aware that growth can not be secured in an animal unless a proper supply of proper food is furnished. For a long time it was not known that plants also must be fed, but chemists by analyzing them have learned the elements and the proportion of each that enter into them.

We have been able then to go to work from the other side, and by sup-

plying a germinating seed with the elements found by the chemist, it has been shown that a perfect plant can be grown which, under proper conditions of light, temperature, moisture, and air will mature seeds.

It was found that plants contain a very large per cent. of water, generally seventy-five to ninety per cent. or more, while a large proportion of the remaining bulk consists of carbon in the form of woody fibre.

In all arable soils the water is present in such abundance that the roots can obtain all that is needed, and with it they take up in solution the mineral food that is furnished to the plants. If we burn a plant the water is first given off, the carbon will next be oxidized and changed into carbonic acid, and the nitrogen and other gaseous elements will also be given off into the air, and we shall have remaining what we commonly speak of as the ash of plants.

In this we find not only the potash and phosphoric acid, but the lime, magnesia, iron, sulphur, and other mineral elements that have been taken from the soil.

#### THE DEMAND FOR PLANT FOOD.

If we would grow plants successfully we must place at their disposal, in a soluble form, and in amounts relatively the same as found in the ash, the same elements as are obtained when we burn them. These elements make up what we speak of as the food of the plants.

As a rule, a virgin soil has an abundance of all these elements, but after cropping for a series of years, one or more of them can not be obtained—particularly after crops have been removed—and the necessity arises of replacing those that are lacking. On light soils deficient in humus, the supply of nitrogen is generally the first to fail, and later on the phosphoric acid and potash will not be available in sufficient quantities to return the best results. As a rule, the other ten elements found in plants will be present in a soluble condition in the soil in sufficient quantities to afford a supply for plant growth, and little attention need be paid to them. We must remember, however, that small as is the amount required of some of them, such as sulphur and iron, that plants can not be grown without them, and as they can be readily obtained, the application of some fertilizer containing them may be sometimes desirable, if made in an experimental way. Having thus hastily attempted to point out the nature of the plant food, and the increasing demand that plants make for it, let us see what the available supply is.

#### NATURE'S SUPPLY OF FOOD.

The first source of plant food is the soil itself, and all our efforts should be turned to the endeavor to so handle it that we can render available as much as possible, and at the same time so treat it as to guard it against loss.

Nature, through the action of frost, water, and air, is continually at work at breaking up the soil particles, changing them into soluble forms, and then taking them into solution, ready to be used by the plants.

Much can be done by cultivation to hasten the development of plant food in the soil, as by plowing we can promote the action of the air, and if the soil is kept frequently stirred through the growing season, the moisture will be conserved and the solution of the soluble salts will be aided. If

the land is kept in fallow without crops, although it will aid in the preparation of plant food and in fitting the land as a seed bed, there will be a marked loss of fertilizing elements through leaching and washing. If the ground has some crop upon it, the roots of which fill the soil, the food as it is developed is taken up and loss is thus prevented.

In case the natural supply of plant food fails, it must be supplemented, in some way, if we would work our machines—the plants—to their utmost capacity. We have at our disposal a great variety of materials that will supply the elements most likely to be needed.

#### STABLE MANURE.

The one that is most commonly used is stable manure, and while it has many valuable qualities that adapt it well to many crops, for fruits it is not an ideal fertilizer, especially if one is to place his sole reliance upon it. We may say in its favor that if it has been carefully collected and preserved, without the loss of any of its valuable material, it contains all the elements required for plant growth, and in about the proper proportion. As a rule, however, a large part of the potash and phosphoric acid has been wasted by leaching and in various ways, so that it is not a well balanced fertilizer. Generally it is excessively rich in nitrogen, and a soft, watery growth is promoted. Moreover, it is generally in a crude condition, and as its constituents slowly become soluble, its effects are lasting. While this may not be undesirable for some crops, it has one fault when applied to tree fruits as it is likely to cause a late, sappy growth to be injured by the winter.

In a well decomposed condition, it is less likely to have an injurious effect; and on light soil, deficient in organic matter, it is particularly desirable for all crops, although least beneficial to fruits. In this decomposed form the application of ten or fifteen two-horse loads per acre will have a marked effect upon any crop, provided the soil is naturally deficient in plant food. If applied broadcast in the fall or early in the spring, this amount, or only half or even a third as much, will greatly benefit the growth of young trees and will enable a good crop of corn to be raised between the rows. In a smaller dose, it may be applied around the individual trees over a space with a diameter a little larger than the height of the trees.

In the application of manure, and to some extent that of other fertilizers, one should judge by the growth of the trees, of the necessity for an additional supply of plant food over and above that found in the soil. For fruit crops on soils that contain a fair supply of humus, the use of stable manure, for the reasons given, can not be recommended, at least for anything more than a partial fertilizer. It can, however, be used to furnish humus, and as a source of nitrogen, but the main reliance can be placed to advantage upon the more concentrated mineral fertilizers. When stable manure has to be hauled any distance over two or three miles, its bulk renders its cost so great, when the labor of man and team is considered, that the chemical manure will be found cheapest if we consider only the value of the fertilizing material contained in the manure. While we would urge all farmers and fruitgrowers to husband all the fertilizing materials that are produced on the farm, and while we believe that the team can be used to advantage during the dull seasons in hauling stable manure from a

distance considerably greater than that given, rather than have them stand idle, the fact that it seems better adapted to other crops still leaves opportunity for the use of other materials as the main reliance for fruits.

#### GREEN MANURING.

Another common means of placing at the disposal of our crops a ready supply of plant food is by plowing under a clover sod, or various green crops. The plant food contained in one ton of clover can not be purchased in the form of a commercial fertilizer for less than six or eight dollars, and it will be only a fair estimate to consider that the value of the plant food contained in the roots from an acre of clover will be of as much value as that of the stems and leaves. The value of a crop of rye turned under is much less than that of clover, and of course the roots are of still less value. Clover, and the same is true of peas and beans, is not only of greater value than rye and similar crops, because it contains a much larger per cent. of the elements required for the growth of plants, but it has the additional advantage of securing a portion of its nitrogen from the free nitrogen of the air, through the action of bacteria that are found in the nodules or tubercles on the roots, while with all other plants the nitrogen as well as the potash and phosphoric acid is all taken by the roots from the soil, which is then depleted to that extent. The rye, then, does not add anything to the fertility of the soil, except that upon decomposing, on being turned under, it adds to the soil a supply of plant food in a form that can readily be taken up by the succeeding crop. It has undoubtedly taken up some plant food that might otherwise have been washed out, and has probably been of value in aiding in the solution of the mineral elements of the soil. On light soils the plowing under of a green crop will add a supply of much needed humus, and it will have an equally beneficial effect in lightening heavy soils. And as a preparation for an orchard or any other fruit crop, nothing better can be desired than a thick clover sod. As a crop for fall sowing in a peach orchard, rye not only has all the advantages mentioned, but it is frequently of value in checking the late growth of the trees and of promoting the proper ripening of the fruit buds.

#### WOOD ASHES.

Of the various manures for fruits, or in fact for almost any crop, none should be more eagerly sought for than unleached hardwood ashes. As will be seen from what has previously been said, ashes contain all of the mineral elements found in the plants consumed in their production; and moreover, most of it is in a soluble form and in such combinations that the valuable portion can be readily taken up and assimilated by plants.

Unleached wood ashes contain, as an average thing, at least three per cent. of potash and one and one half to two per cent. of phosphoric acid, and if dry and free from impurities are worth five dollars per ton as compared with commercial fertilizers, the value in each case being computed upon the actual price of standard fertilizers in the large cities. Leached ashes are of but small comparative value for fruits. Wood ashes have all the advantages of stable manure, except that they contain no nitrogen, and possess to a superlative degree the good qualities of the mineral fertilizers. In case it is found that a proper growth can not be secured from the use

of wood ashes alone, on account of a deficiency of nitrogen in the soil, it can be readily supplied by the use of decomposed stable manure, or of some chemical fertilizer rich in nitrogen.

Among the advantages of wood ashes and of other mineral fertilizers, the fruitgrower should not overlook the fact that a firm growth of wood can be secured, which will ripen properly, and thus varieties that are deficient in hardiness can be carried through the winter, that would otherwise be injured unless given some protection. The same holds true with all fruits whose fruit buds are slightly tender, and when we consider that a difference of a few degrees in the hardiness of some of our fruits will often make all the difference between success and failure, we can readily see that if the hardiness of a variety can be increased even to a slight extent by the character of the food furnished, it should certainly have some consideration when we determine the fertilizers to be used upon our fruit crops.

#### MINERAL FERTILIZERS.

Many of our mineral fertilizers also have a marked effect in disintegrating the soil and thus supplying soluble plant food. To this extent they may be called stimulating, but it can hardly prove very injurious to the soil. From the fact that many of them are very concentrated, containing as much plant food in 100 pounds as can be found in ten tons of stable manure, it can be readily seen that the cost of application will be very small and the transportation to distant orchards will be a small matter.

We must not forget that many of them are of a strong alkaline nature, and when able to disintegrate the soil, they will have an influence upon the tender roots, if brought in contact with them, that will be very destructive, and every precaution should be taken to have them thoroughly incorporated with the soil, and that they are not in close proximity to the roots.

#### POTASH SALTS.

When wood ashes can not be readily obtained, as a source of potash, we have at hand in the German potash salts, a comparatively cheap method of securing potash. These are waste materials from the German salt mines and are sent to this country either in the form of kainit, a low grade of muriate of potash combined with muriate of magnesia and sodium, or in high grade muriates, or sulphates.

When freight rates are high, we shall find it cheapest to get a high-grade muriate or sulphate, containing about fifty per cent. of potash. These salts cost from \$45 to \$50 per ton, the potash being reckoned at about four and one half cents per pound.

#### GROUND BONE AND BONE-BLACK.

As a source of phosphoric acid we should look to ground bone or to dissolved bone-black. The former contains a small amount of nitrogen, but the phosphoric acid is only slowly soluble, while in the dissolved bone-black it is readily available. The iron phosphates, rock phosphates, guanos, and other forms have value, but for fruits the use of fine ground bone is preferable. From 300 to 500 pounds per acre are usually used for bearing

orchards or vineyards, although some growers sometimes use double the quantity. Half the above quantity has a marked effect.

#### NITRATE OF SODA.

For nitrogen, when found necessary, nitrate of soda is among the best materials, if we are to use a mineral. It is mined in Chili and Peru and sells at about \$50 per ton. The nitrogen is worth in this form about sixteen to eighteen cents per pound. Other sources of nitrogen can be found in tankage and other refuse from slaughter houses, in sulphate of ammonia, and other waste materials. One hundred to two hundred pounds per acre of nitrate of soda will be ample, and an excess often has an injurious effect. To use fertilizers judiciously we should first learn by careful experiments what elements are lacking in the soil, and knowing this we can soon find out how much of each element is required. Any other method of using fertilizers is likely to end in disappointment, as we are only throwing into the soil plant food that has cost us money, when the soil already may have more than is needed by the crop.

While many of the prepared fertilizers are all that is claimed for them, we are likely to make a mistake unless we find that our soil needs the elements they contain. Moreover, it often happens that we can buy the elements we need in the form of ground bone, muriate of potash, wood ashes, or nitrate of soda cheaper than the price we have to pay for the ready prepared fertilizer, and if we have made proper experiments we are able perhaps to make up a mixture better adapted to our wants.

As most of these fertilizers are readily soluble they should be applied in the spring. We must understand that before it can be used by plants, food must be in solution, and as for this water must be present in the soil, it often happens that in a season of protracted drouth little or no effect from commercial fertilizers can be seen.

The next paper was by Mr. R. M. KELLOGG of Ionia, upon the highly practical topic,

#### FIGHTING THE DROUTH.

Unlike the great Pacific coast and the arid plains east of the Rocky mountains, Michigan has no snowcapped peaks to store up vast quantities of water in the form of snow and ice during the storms of winter, to be gradually unlocked and distributed through extensive systems of canals and irrigating channels, as may be needed during the long, rainless months of the summer; nor have the rain-makers yet succeeded in producing the needed condensation of vapor constantly passing over our heads, hence, for the present at least, we must look to the bounteous supplies which lie hidden under our fertile fields, and on which we may draw at pleasure.

There are few countries that suffer less from drouth than our own beloved Michigan, and we have only to retain the moisture for a few weeks to accomplish all that is desired in this direction, and this we can do with entire success wherever mulching or cultivation can be put into operation.

There are but few places where the water does not come within a few feet of the surface; and we have but to prevent evaporation, and the sun's rays will draw up an abundance of water to supply the demands of plant

life and even support a luxuriant growth during the trying months of July and August, for these are the only months in which we often suffer serious inconvenience. The drouth of 1893 is reported to have been the most prolonged and severe on record, and yet on my strawberry, blackberry, and raspberry plantations, as well as vineyards, there was not a day when I could not get moist earth within an inch of the surface in all places where the cultivator could be brought to do its work. In one part of a plat of ground, if a well had been dug fifteen feet deep it would have been almost destitute of moisture all the way down, while if it had been dug on the new setting of strawberries, not fifty feet away, the ground would have been found perfectly moist all the way to the bottom. Why this difference? If we had closely observed the first plat, very early in the morning, when the air was colder than the soil, we should have found the vapor escaping as freely as steam from an exhaust pipe. It comes up through the soil by capillary attraction, which goes on even if the water supply be a hundred feet below.

#### HOW CULTIVATION ACTS AS A MULCH.

When the ground is filled with water the surplus passes down through the large fissures which are always present in the ground, but that which is held in suspension, in what we recognize as moist earth, passes off only by evaporation; and if there be no obstruction the ground dries out to a great depth. In the first piece of ground the moisture had escaped with freedom for two and a half months, with no rain to moisten even the surface. It is well known that if in a very dry time we lay a large board on the ground a few days, on moving it the ground is found moist directly under it. Where does the moisture come from? The board obstructed the rising vapor and the ground absorbed it. Now, in the second these capillary passages had been broken with fine earth and a blanket of mellow soil had absorbed the moisture like a sponge and prevented the water from below from escaping. The moisture collects underneath, and, aided by the hot August sun, the vapor would force its passage up to the surface again in four or five days, and so we went over these beds twice per week during July, August, and September, and thus kept them moist. The work was done by machinery, very fast, and was entirely effectual. The instrument we used is called the Planet Jr. horse hoe and pulverizer. It has twelve teeth and a sort of adjustable comb that drags through and crushes every lump as fine as powder. When a rain falls, wetting down even an inch, and the hot sun comes out, capillary action will begin very quickly, and in even a few hours the moisture will escape so that the ground will be drier than ever, and no time must be lost in breaking them up again.

The question is often asked, if the ground becomes very dry shall we cultivate? Certainly; and that, too, as quickly as possible. As already stated, vapor is always coming up, and it should not be allowed to escape. I have often taken a piece of neglected ground, showing almost no moisture at the first cultivation, but the third time it was gone over the ground was quite moist and crops greatly improved. It is of the utmost importance that the ground be pulverized as fine and left as level as possible.

## WATERING PAYS IF PROPERLY DONE.

You can scarcely realize how much water it takes to moisten a piece of dry ground to the depth of, say, six inches. I am of the opinion that for general crops, except, perhaps, in a few locations especially favorable, any system of pumping would not prove profitable. As ordinarily done, watering plants does more harm than good. The only way it can be done safely is to saturate the ground deeply and then pulverize the surface as soon as sufficiently dry.

If the ground is stirred when full of water and then exposed to a hot sun it seems affected similarly to plunging heated steel into cold water. The particles are brought so closely together that they become exceedingly hard, and water can not penetrate them, and the water held in the larger interstices readily passes off, and it often requires years of patient labor to bring the texture back to its normal condition. While light sand is less affected than heavy clay, it is by no means exempt from serious injury by wet working. More plants are killed by setting when the ground is too wet than by any other cause.

## USEFULNESS OF DEEP PLOWING.

Another means of conserving moisture is deep plowing and thoroughly pulverizing the soil all the way down. My practice is, first, to run the Morgan spading harrow (an indispensable tool on any farm) over the ground and then harrow finely, usually going both ways, and then roll to crush all lumps; next, plow as deeply as possible without catching too much subsoil at a time, then roll again and use the spading harrow and fine smoothing harrow, and finish with rolling. Of course this involves some work, but the labor is much more than saved in after cultivation; besides, it is very difficult to get the moisture out of soil pulverized so finely.

There is no question but subsoiling on most soils, the breaking up of the lower strata and pulverizing so as to leave the loose soil as thick as possible, greatly aids in the conservation of moisture.

## MULCHING UNEQUAL TO CULTIVATION.

Mulching does nothing more than the cultivator. It must be sufficiently dense and compact to perform the duty of closing the pores or it will not be successful in preventing the ground from drying out. But there are serious objections to mulching. When once begun, in the case of trees and shrubs, it must be continuously renewed. The roots must have air and the warmth of the sun, and will come very close to the surface to get it, and when once established if we commence to cultivate we cut and tear them to their serious and permanent injury.

Very little moisture goes into the soil from the atmosphere as the result of cultivation, as many people suppose. Whenever the air can penetrate the soil it seems to be its business to absorb water and carry it off in the form of vapor. If we fill a pitcher with ice water, the outside will in a few minutes be covered with large drops of water, and it will continue to collect so long as the water in the pitcher is colder than the air outside. Heat draws moisture, so if at the close of a hot day we cultivate so as to

turn the hot surface down it will draw the water from below and bring the cold earth to the surface, to come in contact with the warm air, it will condense moisture the same as the ice pitcher, only on a gigantic scale, and we can get rain, clouds or no clouds.

#### RESULT OF LACK OF CULTIVATION DURING DROUTH.

I am satisfied beyond doubt that summer management has much to do with the hardness of our orchards and small fruits. Every season has its drouth. In the spring, growth starts actively and continues so until the ground becomes very dry, and then slacks up, and if the drouth is prolonged the wood begins to ripen and often the leaves fall. This is especially true of blackberries, raspberries, plums, and peaches. The fall rains find them in this semi-dormant condition and stimulate a new growth, and this second growth does not ripen before winter, hence even a moderate degree of cold will often seriously injure them. This cultivation should be pursued so as not to let growth stop during the dry time, but should be discontinued so soon as rains come, and the growth will continue until it is stopped by frosts and the cool fall weather, when the wood and buds will be fully ripened.

There is no doubt that an abundance of humus in the soil aids greatly in conserving moisture. The tubes do not form so readily and are more easily broken up. I think this is frequently the cause of failure in the use of chemical fertilizers. They do not have the desired mechanical effects.

MR. W. W. TRACY of Detroit followed with an instructive brief address, of which the following is a synopsis, giving

#### SOME POINTS IN CELERY CULTURE.

It is late, we have listened to most admirably prepared papers which are as concise and full of information as knowledge and care could make them, so I hesitate to merely talk about celery-growing, for, not knowing until this afternoon that anything of the kind was wanted, I have had little time to consider what to say, much less to prepare a paper; but still I am glad to talk to you, for I think that by the culture of no other vegetable can Michigan farmers add so much to their tables at so little cost as can be done by celery. I know that in every farm garden in Michigan better celery can be grown than can generally be bought in the market. How? By a full understanding of and careful attention to the character and wants of the plant.

Just before I left home I received a letter from a gentleman on Long Island, where they grow flowering bulbs by the acre, and he said, in answer to this inquiry, that there was nothing in the soil or climate that gave them any advantage over Michigan; only, "these growers understood the plants, and so could produce them better and cheaper."

I spent some days investigating the reason for the wonderful success and profit in onion-growing about Painesville, Ohio, and the outcome of my observation was that the chief cause of success was, not the soil, but a perfect knowledge of the character and wants of the plant; and the most experienced growers there expressed the same opinion. Doubtless certain

grades of celery can be produced cheaper on such muck lands as those about Kalamazoo, but I am certain that celery can be grown on most of the farms in Michigan, which in quality would be very much better than most of that in our markets.

Yesterday we took out some celery on our trial grounds. Many of the stalks were eighteen inches long, many an inch in diameter, and so brittle that I could and did take a stalk by each end, and by a quick move of the hands in opposite directions, snap a piece out of the center, whose ends were as square as if they had been cut by a knife. Those who used it say they don't care to eat any that they can buy, after having this. And yet, this was grown on a clay soil that, six years ago, would make brick; and if celery can be grown on that, perhaps as poor a soil for its growth as can easily be found, can not every Michigan farmer grow it? They certainly can, if they know how; and to know how they must study the plant.

Every flavor or scent, if intensified sufficiently, becomes disagreeable. Thus the intense flavor of the green portion of celery is disagreeable, bitter, and in some degree poisonous. When any vegetable growth is made rapidly, and in the dark, it becomes white, and its natural flavor is lessened, made more mild; and in such cases as the leek, endive, and celery, made much more agreeable.

Again, crispness, succulency, and tenderness in vegetables is developed in proportion to the rapidity of growth. What we need, then, to produce well-flavored, crisp, succulent, tender celery, is a rapid growth in the dark. How can we do this? Celery is a very peculiar plant in its habit of growth. If we plant an ounce of celery seed, under favorable conditions, it will be nicely up in thirty days; and if we wash the little plants clean of earth, they altogether will weigh from five to twenty ounces, an increase of from five to twenty fold in the first thirty days.

Now, plant an ounce of any of the quick-growing radishes, under equally favorable circumstances, and in thirty days they will be fit to market, and the 3,500 roots produced, if every seed makes a plant, will weigh from 2,000 to 4,000 ounces, an increase in the first thirty days of from 2,000 to 4,000 fold, against the celery's increase of from five to twenty fold. This shows how slowly the celery plant grows at first. But, with every succeeding month, not only the actual growth, but the rate of growth, increases until, as it approaches maturity, it is perhaps the most rapidly growing plant in the garden. But you all know that growth necessitates food, and in this fact we find a reason for our plant's action; for, during the slower-growing, earlier periods, the plant was not only extending its root surface and putting itself in position to collect enormous quantities of food from the soil, but was also storing in the roots and the thickened collar at the base of the leaves, an extra supply of food to be used on demand. We see how the life plan of the plant fits with our purpose of securing a rapid growth in the dark. We simply wait until it is prepared to grow most rapidly, and then gather and hold the leaves up so closely as to shut out the light and keep the growing leaves of the center in the dark, and our object is accomplished. This we do by just drawing the leaves into an upright position and holding them there with earth. Then, drawing them still closer and banking them with more earth, until we have completely shut out the light from the now rapidly growing center, we secure the white, crisp, tender central leaves which are so delicious.

It is a mistake to think that earthing-up turns the leaf-stems which we

earth up, white, and makes them crisp. It does not. It only makes those that grow after we earth-up, white and crisp, and you can thus see how useless it is to expect good celery from slow-growing plants.

But, to have quick growth, we must have abundant food in the soil, abundant water to dissolve this food, and abundant roots and vitality to convey it into the plant. The golden rules, then, for growing fine celery are:

1. Secure strong plants, by protecting the weak and slow-growing seedlings from injury from overcrowding or from more rapid-growing weeds.

2. Set the plants in soil which is as rich as it can possibly be made. The best rule for it is that for making the mince pies we used to dream over at Thanksgiving time—make them as rich as you can afford, and then shut your eyes and drop in two handful more.

3. Bank up and give plenty of water, when the plants are in their greatest rapidity of growth.

I would be glad to talk longer, and refer to some of the difficulties in the way of carrying out these rules, but I have already talked too long; and, if I have called your attention to the principles underlying celery culture, you can yourselves think out methods of carrying them out successfully.

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### *Friday Morning Session.*

A crowded programme was presented at the closing session Friday morning, but it was finished in good order, to the great satisfaction of the large audience. The Lawton people evidently could and would have enjoyed a full week of the good things presented at this meeting.

#### HOW LAWTON GROWERS PRUNE GRAPES.

Mr. MONROE presided, and in opening the session remarked that a grapevine had been brought in, trained according to the method prevalent at Lawton, and would be pruned according to the local practice.

Mr. LAWTON: We are after grapes, not theories, at Lawton; we go in for the most money and the least labor. Grapes at one cent per pound leave no time for debate as to experimental training.

The vine, supported upon a Kniffin trellis, was much branched and in tree form, the branches long and sweeping to the ground, just as it was when the leaves fell. Mr. LAWTON showed how he would prune it, and how branches or arms would be left for renewal from the main vine. The plan involved much shortening of the branches, leaving two or three buds on each spur, but with long arms.

Mr. A. H. SMITH commended Mr. LAWTON'S plan of pruning, the

selecting of strong branches for renewal, from as near the main cane as possible. Some trim out their vines in fan shape, but if the vine is started so it is hard to change it to the Kniffin system.

Mr. FRANK STAINTON, having been asked to do so, trimmed the vine in about the same way as described by Mr. LAWTON, leaving four arms (two on each wire) and forty to fifty buds.

#### METHODS IN MARKETING.

This subject was taken up, and introduced by the following paper from Mr. J. G. RAMSDELL of South Haven:

This question of the fruitgrowers marketing their own fruit has been discussed quite frequently in many fruit sections, with varied success and failures. In a few locations, better conditions have been effected, while others have remained unchanged, still pursuing the good old way of giving the middle-man the lion's share of the profits.

California growers have demonstrated through agencies that they can distribute their own fruit by sending it into the most of the chief centers of the United States, their best fruit packed and delivered in the best condition; claiming and receiving the highest price in all the principal markets of this country from ocean to ocean.

How has this been accomplished? It certainly is not the large size nor superior quality of their fruit alone, that has enabled these kings of the fruit market to monopolize the chief centers of trade from one to three thousands miles from home. Nor is it to be attributed to cheap lands, cheap labor, or cheap transportation, but to the perfect system of selecting and packing only the best fruit in the best manner and leaving the balance at home. This fruit is put up honestly and handled carefully, and is sought after by the dealers, by the carload, and sold by samples that don't lie. In fact, it goes without saying that the buyer of a carload of California fruit knows as well what is in the car before it is unloaded as though he had opened every package. In confirmation of this statement, a commission man in Chicago said he could handle and dispose of a carload of California fruit with less trouble and expense than he could one fourth of that amount often shipped to him by several parties in Michigan on the same day.

Does any fruitgrower of experience in Michigan doubt that what has been done by California, on so large a scale, with all the drawbacks of a distant market, can be done at other points, where fruit can be grown as cheaply and placed on the market in less time, and at much less expense? I am not alone in the belief that the fruitgrowers of Michigan are able to compete with California, or any other state in the Union, in the different fruits raised within their borders. To be sure, California, as a rule, can raise more fruit to the acre (being very much larger), but the high-priced land, with water for irrigation, and the extra cost of labor and freight, will more than overbalance the account in our favor. Their insects and fungi, as a whole, are as damaging as ours, so we are even on that drawback.

Michigan has a new competitor in the large central markets of the

north, which is the far south. The southern fruitgrower has the advantage of the northern one in cheap lands and cheaper labor, besides being the early bird in the market. There are many points now in the south where the fruit is sent to northern cities by the car-load, and in a few places it is shipped by train-load, thereby reducing freights and avoiding delays.

Now, in view of these facts, and many more that might be cited, what are the fruitgrowers of Michigan going to do in order to build up a reputation that will enable them to compete with others who are rivals in the business and holding a monopoly in the markets?

The fruitgrowers of Michigan are as well located for marketing their fruit as are those of any state in the union, except New Jersey and Delaware; but for many obvious reasons they fail to realize as high a price as most other localities, which are not so favorably situated. This would seem to indicate that something was wrong in their system of doing business. Now, what is the matter with Michigan? It is estimated that seven tenths of all the fruit raised in the state are sent to Chicago to be sold on commission at ten per cent. Add to this the cost of packages, freight, and cartage, all of which is paid by the shipper. These expenses must be paid wherever we market our fruit.

Now, as the amount of perishable fruit sent to one place determines to a large extent the price obtained, it is just as certain that, in case of an overflow, we must expect low prices. This being the fact, it should be the best reason in the world why we should make a change and send our fruit to other points, thereby avoiding the glut of an over-burdened market. But, says the fruitgrower, I can't send my fruit all over the country to irresponsible parties, incurring heavy express rates, and subject to more or less losses. Besides that, I have no time to attend to the details of the business.

This is all true, or nearly so, and the fact remains that one individual is not always able to do it. The main reason complained of is that it costs something to look up customers in different localities, and the express charges are outrageously high. This is also true, and as a rule there is no remedy for the individual man who distributes his own fruits in the different markets. Yet, as there are exceptions to most rules, I will only note one that came to my knowledge, which proves very conclusively that even one individual is able to make a success of distributing his own fruit, in spite of all the disadvantages with which he had to contend. He started out single-handed and declared he never would send another basket of fruit to Chicago, and he would make his own market or perish. Three years ago last June he began to correspond with dealers at different points on one line of railway, and before shipping-time he had customers engaged for all his fruit. The result was, every one was satisfied with the fruit, which was all sold at remunerative prices; and, after paying regular express charges, the returns were in excess of Chicago net. The fruit was not above the average in size nor quality, but it was graded and packed honestly. The next year the sales were extended on other lines, with more favorable results. This year, with a very heavy crop, his peaches were all wanted at good, paying prices, and he was unable to fill his orders. Not a basket was sold in Chicago. Others could be named that have done well in a private way.

Now, if this can be done by individual effort, is it not sufficient evidence

that a combination of fruitgrowers can do the same much more successfully?

How so? asks an inquirer.

Now, right here is the key to the whole vexed question of fruitgrowers marketing their own fruit. If a majority of the fruitgrowers of Michigan would grade and pack their fruit in first and second-class packages, and print their names on the same, guaranteeing every package to be the same all through as it is at the top, with the trade-mark of the association stamped on it, there would be no trouble to sell it in Chicago or anywhere else where fruit is wanted. This fruit would soon bring a much better price in almost any market than that without a guarantee. The great fraud with the most of the fruitgrowers in Michigan is (and I know what I am saying), they pack their first and second-class fruit in the same package, and then expect to receive first-class prices. That is what kills the fruit market in any locality, and the same practice would in one year's time ruin the high reputation which California has won for herself.

Without attempting to solve all the problems in detail, pertaining to this question, I will only add that the South Haven and Casco Pomological society discussed, three years ago, in fourteen meetings of three hours each, this one question. The result was that from a list of over one hundred persons, of those who shipped fruit from South Haven, only seventeen could be induced to sign their names to an agreement that they would grade and pack their fruit in first and second-class packages, and put their names on it, guaranteeing the fruit to be as good, and of the same grade throughout the package, as it was on the top.

If a majority of those fruitgrowers at that time had formed an association, the terms of which required them to pack their fruit honestly, there is not the shadow of a doubt but they would have gained a reputation for good fruit, by this time, that would be worth thousands of dollars. Yes, and it would have laid the foundation for a market which, if followed out *honestly*, would add hundreds of thousands of dollars to the income of the fruitgrowers of Michigan.

If the same dishonest methods that are now practiced by the majority of Michigan fruitgrowers should be adopted by manufacturers, in their different lines of business, it would be safe to predict that nothing but absolute ruin would be the result.

The wonder is to me that the bulk of the fruit sells for as much as it does, when we take into account how long these frauds on the market have been practiced on the public. If this contemptible business of dishonest packing is ever to be remedied it must be done by a combination of those fruitgrowers who are willing to put their names on their packages, thereby guaranteeing the contents to be the same throughout as on the top, graded to a standard adopted by the association, with trade-mark attached to the package.

This and this alone would, in a very short time, establish confidence in the markets for Michigan fruits, at paying prices, and enable us to compete with the whole country. If this is not done in the near future, the reputation for Michigan fruit will soon be so low that it will go begging for purchasers, and the whole business be demoralized.

This was followed by the subjoined two papers by two well and favorably known commission merchants of Chicago:

FROM MR. GEO. W. BARNETT.

In response to an invitation to be present at the meeting of the society, to be held at Lawton, 28th and 29th insts., I must say I fear I can not be present, as other and important engagements previously made will probably prevent. In place of my presence, your request for a paper on packing fruit, especially grapes, is certainly a wise one—that is, it would be if I could write anything not already known.

It, however, is a subject that needs constant reiteration to impress itself on the minds of those who carelessly drift away from correct methods. It is easy to drift with the current when apparent self-interest aids the motion. It is hard to resist temptation, when secrecy is assured. When the standard of right is set high, and the mature judgment assures us that only in that direction lies permanent success, we find the way very easy to lower the bars a little and admit some things that should be barred out, and console ourselves with the thought that our present gain is all right, and it will never be known.

No trade-mark ever became of value except through a rigid adherence to a high standard of excellence, and the value of a trade-mark lessens daily as the standard of excellence is lowered, in actual test, even though nominally the grade is the same. "Sapolio" is the same now as a dozen years ago, and "Kirk's" or "Pears'" soap or "Royal" baking powder have the same formulas that first brought their virtues to public notice. I grant you that mechanical formulas, or the mixing of certain ingredients whose properties can be determined by chemical analysis, and whose imperfections can be corrected, are far easier to maintain to a fixed standard than is the grading and packing of fruit.

Yet it is possible to approach nearer the ideal—the standard—if we are willing to sacrifice present gain to permanent prosperity. To maintain a high standard, the manufacturer often loses heavily in spoiled materials, in errors of judgment, and in various ways; but these he considers as nothing compared to the record he must maintain.

We demand honesty and excellence to the extent of the price we pay. We don't expect a pound of exquisitely perfumed toilet soap for the same price we pay for a pound of strong laundry soap; but, from the day laborer to the bank president, all demand what they buy—honest delivery of the goods purchased.

On the same lines, the seller justly demands pay for his wares, and the man who would undertake to pay his bills in depreciated currency, something not a legal tender, would be soon brought up with a sharp turn.

We thus see that theoretically (and practically) all the world over, business is carried on upon the basis of honesty and integrity—the delivery of the goods bought, and the payment in full for goods delivered. Any violation of this fundamental rule of action is condemned, and the violator is punished; if possible, by law, if beyond the reach of the law, by that which is mightier, public opinion.

To men whose life business is the growing of fruits for market, the views of one who has made the selling of fruits a business for more than twenty-five years may be of interest, yet the views I entertain are clearly along the line of thought expressed. No rogue can long prosper in business. I have seen too many wrecks along the shore, to make me believe for a moment that trickery and fraud in business will succeed. It is a violation of the

settled principles of successful business, and "Honesty is the best policy" is as true as it is trite. If it is the best policy in mercantile business, it is true in all branches that contribute to business. As fruitgrowers you must be honest with your land. You can not rob it with impunity, and with your trees you must pursue the same course. In all your transactions with nature, any departure from that rule will be punished. Reflect for a moment, and you can readily call up in your experience instances where the punishment was sure if not swift.

So, too, after your trees have bloomed, and your efforts, aided by the sunshine and the rain, have produced a crop, the same inexorable law must be obeyed. Strict integrity and honesty in the handling (for 'tis dishonest to bruise and damage by careless or reckless methods the fruit you have produced) and packing of fruit should be observed. Let your package be of standard size—your customers demand it. Let it be of approved style—that the purchaser requires, and honesty to your interest demands it. Let it be of good quality—self-interest says it is economy.

In packing, let the contents be honest, and just what you represent them to be. If No. 1, let it be No. 1 all through. If of inferior grade, so indicate it on the package.

It's a great temptation, when away a hundred miles from the purchaser, in the seclusion of your orchard or vineyard, to use the No. 1 stencil on No. 2 goods. It may seem as though you would be safe from detection, and no one will know the difference, but is it honest? *You* will know it, and your trade-mark, your reputation, will suffer, and your credit in the country markets will be gone. Credit is of slow growth, and easily destroyed.

Two years ago, one section of Michigan had an enviable record in the quality of grapes shipped to Chicago. One year ago, the tampering with grapes was marked, and this year no one cared to purchase on the "mark." Personal inspection alone was relied upon by buyers. Now, who lost by the tampering with the trade-mark?

Another section that had a high standard, lowered it considerably this year by packing inferior stock of grapes for No. 1.

Men of Michigan, it is worthy of your careful consideration, this honest, manly packing of fruit.

"Western Michigan apples," for years was a by-word among the fruit dealers of this city, so notorious had been the violation of the common rules of honesty in packages and packing, although I am glad to note improvement in that line.

True, the apple crop was almost a failure, and the fruit inferior, and what was shipped the best to be had, yet I am sure the damage to the fair name of the western fruit belt in the aggregate was immense.

It is well to note that New York is a strong competitor, and by strict methods she holds up her grading, so that it is now perfectly safe to buy New York grapes without seeing them. All that is necessary is to have the "standard" mark on the packages.

The almost universal use of the Climax basket makes comment on the package for grapes unnecessary.

I trust I may be understood in what I have said. Were I to put it in one sentence, it would be, "Do unto others as you would be done by, for your sin will find you, as surely as honesty is the best policy."

FROM MR. R. A. BURNETT.

In compliance with your request to furnish a short paper upon the packing of fruit, we herewith submit the following. In doing so we fully understand that it will be difficult to say anything new on this very important matter. Some three years ago you had us on record on this subject, but as many do not seem to understand how important a thing it is to pack fruit honestly and intelligently, the following may not be without value.

Lawton and vicinity, in years past, made an enviable record for the packing of its greatest product, the grape crop. Until within the last two years, to say that the grapes were Lawtons satisfied the purchaser that he was getting a full package of honestly put up fruit; not clusters on the top layer in the basket and loose ones underneath, nor baskets only three fourths full, as has been notably the case this past season. Especially has this got to be a nuisance since the growers are shipping as an association.

The different growers putting their fruit into the same car, and being consigned from one firm, they become mixed up and we have honestly and heavily packed fruit in a number of packages and others will be lightly packed and undesirable. It certainly has made the best dealers shy of buying Lawton grapes as they run, and it puts the seller to the inconvenience of sorting out the different packages and selling them upon their merits.

This hardship should not be imposed upon the commission merchant, for the fruit has to be handled expeditiously, and all hands are busy during the market hours, and unless grapes are held over for a day there is no opportunity to sort them.

Reputation is a most excellent thing in business. We are jealous of that. Perhaps more touchy on our reputation than we are on any other subject, claiming, as we do, to represent fairly to the purchaser and fairly to the consignor. It certainly behooves the association in Lawton to refuse to take the goods of a grower who does not pack on honest business principles. We know that the producer can not pack any better fruit than his vineyard or orchard may yield, but he can fill his packages up to the regulation limit, even though they are in a close basket with a close cover and no one can tell that they are not full until tested by weight or the cover removed for the inspection of contents.

The package now used by the growers has come to be a standard in the market, namely: the eight-pound Climax basket. We have nothing new to suggest along this line. Indeed, it is always to the disadvantage of the growers of a locality to change their package when they have made a reputation on their fruit.

We believe that the "snide" packer as well as the "snide" dealer or commission merchant, has but a short business life to live; but during his unprofitable career he works a hardship upon the honest competitor, and as it is now the order of society to organize into associations that will prevent, so far as may be, the unworthy from interfering with fair dealing, we would recommend that your association authorize the inspection of all fruit shipped under the name and protection of an association. If the association does not protect its majority against a minority it can not be profitable to its members or society at large.

## COMMISSION MERCHANTS DISCUSSED—HONEST METHODS DEFENDED.

Mr. LAWTON: These papers have answered the prayer of the poet, so far as it applies to the fruitgrowers of Lawton, "O wad some power the giftie gie us to see oursels as ithers see us." They are admirable letters and depict correctly the condition of things in this vicinity. And I hope, too, that these gentlemen are honest (I believe they are so), and do themselves as they recommend others to do, and that they make their influence felt all up and down South Water-st. (Laughter.)

Mr. A. S. PACKARD: During the last two years I have shipped from 7,000 to 8,000 bushels of peaches, and only 500 of the whole went to Chicago. I pack my fruit honestly, as I would have fruit for myself if I were to buy, and send constantly to the same houses. If we do not pack fruit honestly, we ought not to be successful. I have obtained from 46 cents to \$1.31 net per bushel for my fruit, but am not going to tell how I worked up my trade. One commission man once asked me not to put "No. 2" on my baskets, because he "only had to scratch it off." I am confident that there will continuously be money in peaches if we only put them into the right markets.

Mr. VAN FLIET: They talk of honest packing, but an honest fruitgrower is a rare quantity. (Laughter.) I have sent my best and my lowest grade of grapes to the same commission merchant, and got as much for the one as the other. I hope there are honest commission merchants; doubtless there are, but if they are no more numerous than honest fruitgrowers, there are not enough to do much harm in the world. Here in Lawton, "snide" packages of grapes have sold direct to buyers for as much as the best. If there is no way but honesty to remedy this, I fear the efforts will be a total failure.

Mr. LAWTON: All peaches grown here are sold direct to wagons.

Mr. PACKARD: I last year sold \$3,000 worth in that way.

Mr. J. A. EDMONDS of Schoolcraft: I notice that when we come to Lawton to buy peaches we have to pay fully as much as the selling price in Chicago.

Mr. ATWELL: It is right that the peddlers should do so. They make a profit on their retail sales, and take only our very best fruit, such as sells for \$2.50 and \$3.00 per bushel in Chicago.

Mr. MORRILL: Honesty will sell fruit anywhere and command a market. The man who does not observe honesty in his methods of marketing must go to the wall; and the shrewd growers are seeing this. The wagon trade is a good one, but it will not take any of the lower grades of fruit, while Chicago will take and dispose of everything. Therefore the

peddlers should be required to pay more. The country is not half supplied with good fruit, but is covered with trash. I am a friend and defender of the commission merchant within all reasonable limits. There are, of course, dishonest men in the business, but they will average better than the fruitgrowers. They have to be honest or they are soon found out and have to quit. I speak from a watchful experience of twenty years in South Water-st. Eight or ten years ago I selected a man whom I thought suitable, packed my fruit honestly, so that it is throughout as it appears on the surface (not different from its apparent grade), and have kept constantly with the same man. In times of glut it is only the good fruit that will sell at all. We do not successfully combine, because we suspect one another; but I do not know why we do this unless we know ourselves to be dishonest.

Mr. LAWTON: Two years ago we formed an association here and much fruit went into it, all pooling and sending in car lots. The results were about the same as if we had sent separately to commission men. Full weight and quality were guaranteed, too. I think we are too near Chicago. The commission men flock in and solicit so that it is hard to keep an association together.

Taking up the general subject of peach-growing, the society listened to the following papers:

#### PEACH CULTURE VS. GENERAL FARMING.

I realize my inability to do justice to this subject, or to make apparent its importance. Although I have been engaged to some extent in growing peaches more than a quarter of a century, I have made so many mistakes, and failed to learn so many valuable lessons, that I shall not expect to enlighten experienced growers, but hope to offer some suggestions beneficial to those who, without experience, may desire to engage in this industry.

Many locations in our vicinity, the northeastern part of Van Buren county, only wait development to yield (even some small fields) more profit annually than the entire farm of forty or eighty acres, in present conditions, could be sold for. Even hundreds of acres in that vicinity, as well as elevations in other parts of the county, now used for general farming, with little profit to the owners, could be utilized for fruitgrowing, with much profit to the owner, and would employ profitably our young people who are going out seeking other fields for employment. Such an industry would soon require better and cheaper transportation facilities, better highways, and more homes, all of which would add materially to the general prosperity.

Engagement in peach-culture with prospects of success requires several favorable conditions, coupled with the same energy, attention, and intelligently directed efforts required to secure success in other callings. With

these favorable conditions, and the other observations strictly adhered to, much more satisfactory results can be secured than from general farming.

*Location*—One of the most important of all conditions is a favorable location. It should be a selection with not only natural water drainage but air drainage as well, to insure against damage by late spring or early autumn frosts; for frost, like water, seeks the lowest levels. Therefore, the greatest elevations are best, and more sure to produce good crops of peaches annually.

*Soil*—The soil may be variable, from light and sandy to a medium heavy soil, but it must be dry. Sandy loam is best, although some varieties, like Hill's Chilli or Late Crawford, do well on a clay loam.

*Varieties*—Another very important consideration is to select those varieties that are adapted to your soil and location, and such as will give a succession in ripening. Unless your experience in peach-culture will help you to decide what varieties are best to set, to secure the desired results, it would be wise to consult the nearest successful growers, whose experience might save you much. Varieties that do well in one location do not always succeed in another. Therefore I emphasize "nearest successful growers."

The State Horticultural Reports contain the experience of many of the best and most successful growers in the state, as well as the reports of results of the several experiment stations, which are conducted by experts, all of which is very valuable to not only the new beginner but even the veteran grower. Among the many valuable horticultural journals is the Allegan Gazette, published by E. C. Reid, secretary of the State society. One department of each paper is devoted entirely to the fruitgrowing interest. These journals and reports aid much in determining what, among the multiplicity of varieties, to use and what to discard. Thousands of dollars are annually paid for high-priced specialties that are not worth the cultivation, so time, money, and use of land are all wasted.

The planter who has set several varieties in rows or blocks, with a view to their successive ripening, not only for the purpose of continuous work at harvest time, but with a future view to supplying some particular market with a constant supply of his fruits, can not count his loss in dollars if he finds that his trees when fruiting are not true to label, and his succession is broken up, if not mixed through the entire lot. I have known of many such instances, and much loss by the planters.

*Preparation of Soil*—A thorough preparation of soil before planting will aid much in setting, cultivation, and in the early growth of the trees.

*Planting*—Plant as early in spring as the ground can be properly fitted. Trim to a whip or stub and cut the top at the height desired for starting the head. Set one rod to twenty feet apart and put in rows both ways.

*Cultivation*—The cultivation should be thorough each year, up to about August 1. Then discontinue to allow the new wood growth to fully mature and harden up, to better resist the cold of winters; except, if the trees are well laden with fruit, the fruit needs and will take the extra flow of sap induced by the continuous stirring of the soil. Bank around the body of each tree with earth, late in fall, for support and protection, removing the same early the next season.

*Pruning*—Proper pruning of the trees each year is a necessary part of the work of a successful grower, to shape and balance the top and to prevent the formation of bad crotches that are quite sure to split down in storms or when laden with fruit, and greatly injure if not destroy the tree.

*Protection from Pests*—To prevent injury from mice and rabbits and borers, use a mixture of soft soap and sulphur, equal parts, and apply to bodies from the limbs to roots, replacing the soil that had been removed so as to apply to large roots and lower parts of the body. Tarred paper will, if properly put on the bodies, answer a good purpose if the first is not conveniently secured.

*Thinning*—Proper thinning of the fruit must be observed if choice, good-size fruit is desired, and for the purpose of retaining the full vigor of the trees, which are much exhausted by an overproduction of pits.

*Picking and Handling*—Picking requires a practiced eye to discern the proper condition of maturity, careful handling, and honest packing (alike through the entire package). Good fruit picked and packed properly in clean, full-size packages, will win its way in any market to good prices and continuous trade. In fact, the market will seek the producer of such fruit.

*Peach Yellows*—This dreaded disease of the peach, apricot, and nectarine is, in my opinion, a benefit to the peach-growing industry. It tends to deter the timid from planting, and soon destroys the orchards of the careless or negligent, which would, quite likely, fill our markets with an inferior quality of fruit, while the energetic, watchful, earnest growers but little fear the disease; for, where a persistent policy of total destruction, as the law provides, of every tree in which one peach or twig has developed the disease, is followed, the interest continues to thrive, as it has for many years along the lake shore in this and Allegan counties. While our scientific men have, without doubt, discovered bacteria existing in all diseased trees, no remedy has been discovered. Only total destruction of all affected trees, in any locality, can save the interest where it exists.

*Is the peach-growing interest likely to be overdone?*—Many years ago I feared such a result, and was very cautious about engaging in extended cultivation. The first crop from my orchard sold for from 25 cents to \$1 per bushel. The latter price encouraged me to set more. Not until I had sold five successive crops from my small orchard of less than  $1\frac{1}{2}$  acres, for an average of \$300 per year, did I gain full confidence in the permanence of the industry. And today, to all living where location and climate are congenial, and who are willing to give the same energy and attention to secure full knowledge of the business, and bestow the care required as the price of liberty, I can say, in my opinion the future of peach-growing promises more success than does any other agricultural industry.

While the area seems to be circumscribed to some extent, almost yearly, where peaches can be grown, the markets are extending, and in all localities the demand is increasing. Only a few years ago, canned fruit was only in the homes of the well-to-do. Now, in ever so humble a home, canned fruit (peaches, largely) are counted among the necessary family supplies. I remember when from 20,000 to 40,000 baskets received in Chicago would send the price down so low as to bring loss to the grower. Now it requires from twenty-five to thirty thousand baskets each morning to supply one peach to each of the residents of Chicago alone, besides the demand from millions of homes near which such fruits can not be raised, including many cities that will use a train-load each day.

When I came to Gobleville, in 1887, I planted on some village lots eighty-four trees, sixteen feet apart, about one half acre, from which I harvested in 1891 (when the trees had been set four years) 169 bushels of

peaches, which I sold at one dollar per bushel at the orchard. I have harvested a good crop each year since. I found we were still in the peach belt, and have now an interest in several orchards in that vicinity. My ambition is to see all the elevations in that part of the county, where land is cheap, so utilized for peach-growing and for other fruits, as to require a fruit train and cheaper rates, as you have here in Lawton.

#### PROFITS.

For the encouragement of those who wish to engage in peach culture, I have gathered some statistics from growers, which I think fully reliable and quite satisfactory, especially when compared with results of common or general farming.

Mr. O. R. SCHUYLER, who lives in the township adjoining my home, on the west, writes me, under date of Dec. 18, 1893, saying: On 1,000 trees, in 1891, which had been four years set, I harvested 2,000 bushels; on the same trees, in 1892, 2,500; in 1893, 3,000; in all, 7,500. They averaged one dollar per bushel.

WILLIAM CROSBY of Gobleville, who owns an eighty-acre farm on one of the greatest elevations in Pinegrove township, adjoining us on the east, harvested from one field of his farm, in 1890, peaches which sold for \$300; in 1891 he harvested 1,471 bushels, which sold at a profit of \$1,835; in 1892 he had mislaid his sales account; in 1893, from ten acres, he sold 1,162 bushels for \$1,509.20, a total for two years of \$3,344.20. Expense of picking and hauling should be deducted.

HOMER CROSBY, a brother, whose farm adjoins WILLIAM'S, has been very particular to keep accurately the account with his farm, and particularly with his peach orchard, consisting of about fifteen acres, for the term of eight years, which account is as follows:

1886, 263 bushels.....	\$	560 45
1887, 621 ".....	\$1 71.....	1,065 05
1888, 745 ".....	1 61.....	1,202 44
1889, 365 ".....	2 33.....	853 76
1890, 97 ".....	2 77.....	265 70
1891, 2185 ".....	1 30½.....	2,855 57
1892, 1059 ".....	1 81½.....	1,923 36
1893, 1594 ".....	1 41.....	2,267 70
Total.....		\$11,194 03

This report does not include picking and hauling to Kalamazoo, which was done by himself and hired help. Expense for packages, etc., must also be deducted.

The CROSBYS farm the balance of their land, but claim potatoes and fruit to be the only paying crops, and each has purchased trees with which to plant new orchards the coming season.

I do not wish to convey the impression that every person who sets a peach orchard will accomplish as much, or secure so good results, as those quoted. Some do fail, as in all other avocations. But others I have in mind have accomplished as much, and even more than any here quoted.

The one idea of most importance, I wish to convey, is the grand opportunity open to all, but more especially to our young people, who are leaving home and familiar associations for new and strange fields and surround-

ings, and perhaps for unlearned occupations, and would urge upon all such to fully investigate and ascertain if there is not some field or corner of the old farm, which would hardly be missed, wherein are offered opportunities for more and greater profits, if judiciously planted to fruits, than have been secured from the entire farm as it has been used for the production of common farm products.

Another consideration worthy of the attention of all our people, is that we are going over too much land, and properly working too small an amount, losing in both ways. Fruit culture very soon acquaints us of these facts, and, where most largely followed, results in more homes, better homes, and more general prosperity.

Regarding common or general farming, I submit to those who still persist in raising sixty-cent wheat, fifteen-cent wool, or fifty-dollar horses, to compare notes and satisfy themselves if more diversified industry will not bring better results, and keep John and Jane at or near home to help secure them.

N. W. LEWIS.

*Gobleville, Mich.*

#### THE FUTURE OF PEACH-GROWING.

In requesting me to furnish a paper on "The present status of peach-growing in Allegan county, with a general view of the condition, opinion as to the continuity of the business, its methods, needs, dangers, recent changes or pending ones, and any new points that may be within my knowledge," you have given me a rather large field to range over—one beset by many difficulties and obstructions, great discouragements, and heart-breaking disaster, and yet embracing, perhaps, more pleasant pathways to success and its accompanying competence and enjoyment of life than any other line of rural pursuit.

In attempting to comply with your request I shall confine myself to matters within my own knowledge, or belief on authentic information, and relating to the western part of Allegan county.

#### PRESENT STATUS.

I think I may safely say that peach-growing is the chief end and aim of every one who is the owner of a suitable piece of land, and all land seems suitable that is sufficiently elevated, and provided with good air-drainage and soil drainage, from the heaviest clay to the lightest blow-sand, though the amount and quality of the product is more or less affected by the varying quality of the soil, even under equally good treatment. It seems to be demonstrated that, in this lake shore region, peaches can be grown successfully wherever the trees do not suffer from extreme cold, or late frosts, or wet feet.

#### CONTINUITY.

As to the continuity of peach-growing, I see no reason (if the yellows law is enforced) to apprehend that it will not continue indefinitely in this region at large, although some sections of greater or less extent may, as

some have already done, discontinue the business for a time on account of the ravages of yellows.

#### METHODS.

The proper methods of setting, picking, packing, and marketing the fruit, have been so thoroughly described and discussed and published in the proceedings of this and other societies, that any extended consideration of the matter in this paper seems unnecessary. But it may not be amiss to say a word in regard to transportation, a very important factor to pecuniary success. For several years past the shipments from Fennville have been made on the so-called granger plan. That is, the railway company simply furnishes the necessary cars and transportation, at a fixed rate per car, the loading and unloading being done under the direction of an association of shippers. This plan has proved the most satisfactory, and the cheapest way, that has ever been tried. The only cause of complaint, the late arrival in Chicago, a matter of frequent occurrence in former years, was remedied this year; and, so far as transportation is concerned, the past season has been eminently satisfactory. A very important incidental advantage of this method of shipment is that the addition of a fraction of a cent per basket to the actual cost of transportation and handling, which is necessary to provide for emergencies, pay shortages, and protect the association from pecuniary loss, provides a fund which, after all legitimate claims are paid, is devoted to improving the roads leading to the shipping point. By this means a great improvement has been made in some of our most traveled roads. Hills have been graded, hollows filled, and the surface covered with the best road material obtainable, to the great advantage of the public in general and fruit shippers in particular. It was considered that the money in the treasury of the association could be applied to no better purpose, nor one more to the benefit of those who contributed it (the shippers) than by improving the roads over which the fruit must be hauled to reach the railway. Each year the work is extended further from the shipping point, is of present and lasting benefit to the community, and is a valuable object lesson to pathmasters and others who have to do with the making of roads.

#### RECENT CHANGES AND PENDING ONES.

The danger to peach-growing from yellows has been a matter of serious consideration for a number of years; and, with the almost complete failure of the peach crop in 1889 and '90, has led many growers to turn their attention to other kinds of fruit, so that the present indications are that the production of currants, gooseberries, grapes, pears, and plums will assume increased proportions as a substitute for or supplementary to peach-growing.

#### NEEDS AND DANGERS.

The dangers to peach-growing in this region, I think, may be included in the one word, yellows. The needs are, a good yellows law, which I think we have, notwithstanding it has been declared unconstitutional by cross-roads lawyers and parties who are opposed to its enforcement; com-

missioners, appointed under the law, the appointment to and acceptance of the office, and the record of the same, to be made according to forms and instructions furnished by prosecuting attorney, in order that no technical flaw may be found should the matter come into court, and who are of sufficient intelligence to work according to the law and instructions thereon, and with sufficient backbone to prosecute to the full extent of the law any infraction thereof, even by their nearest neighbor or dearest friend, and justices who will not refuse to act in a yellows case, or, when they do act, will not be deluded nor scared by an attorney into throwing the case out of court on any trifling claim of technical error in the proceedings. It is a notorious fact that, in many cases, owners of diseased trees refuse or neglect to destroy them according to law, in some cases defying the commissioners and scaring them from doing their duty, and in other cases, when arrested, getting off on payment of a small fine, or are discharged on account of some technical flaw in the proceedings; and such men have lost and are still losing their own orchards and causing the loss of all neighboring orchards. It is evident that the continuance of peach-growing depends on the rigid enforcement of the yellows law, and every enlightened grower should do all he can to strengthen the hands of the officers charged with the enforcement of the law. A few convictions, with severe penalties, would make the future work of the commissioners comparatively easy, and render it possible to keep the disease in check. But neglect to enforce the law, allowing a few shortsighted individuals in each neighborhood to infect, by their neglect, all the surrounding orchards, as has been done in some sections, will result, in a very few years, in making peach-growing a thing of the past.

HENRY HAWLEY.

*Ganges, Mich.*

Time was too limited to permit discussion of these papers or their important subject, so President LYON proceeded with the following account of

#### WORK AT THE SOUTH HAVEN EXPERIMENT SUB-STATION.

The chief object sought to be accomplished by the establishment of the fruit-testing station at South Haven seems to have been, by actual fruiting, to afford the public reliable information as to the comparative values of such varieties of fruits and plants as are, from time to time, originated and offered for sale, and to gain some reliable idea of their adaptation to the climates and soils of this state, whether for family or commercial purposes.

Important, though incidental, objects to be gained, were the comparative values of different systems of pruning, training, and management, as well as the most effective methods of combating insects and fungi.

We think it well to state that planting was commenced, upon a portion of the present premises, as early as 1888, with no expectation that it was to be employed for experimental purposes. These plantings comprised nearly the entire circle of the hardy fruits and nuts, carefully selected, chiefly, for their adaptation to home, rather than commercial uses, and included the cream of the high-quality varieties of such classes. In grapes, however, considerable numbers of commercial varieties were planted, with more or less reference to the propagation of plants. It will

be readily understood that, especially in the case of the tree fruits, the process of testing must necessarily be a very slow one, and that few if any of these are yet in bearing sufficiently to afford a proper test of value.

There is perhaps no more effective way of giving an idea of the work of the station than by reviewing, hastily, the operations of the past season.

The extreme and long-continued wet weather of the spring and early summer of 1892 had occasioned more or less enfeeblement, and even permanent injury, especially to strawberries and other small fruits, accompanied by a severe attack of anthracnose upon raspberries and blackberries; leaf spot (*sphaerella fragaræ*) on strawberries, and more or less anthracnose and mildew on grapes, with apple-scab and various other fungi.

For the purpose of destroying the spores of these fungi, after the pruning of the grapes and the cutting out and burning of the old canes and other debris, the entire plantation received a spray of Bordeaux mixture.

Early in the following April the spray was repeated upon the plat of small fruits, with the apparent effect that anthracnose almost entirely disappeared upon raspberries and blackberries, as did also the leaf-spot of the strawberries.

After a spray of Bordeaux given currants and gooseberries, early in April, these were treated with a preparation of liver of sulphur, about once in three weeks, with the addition of a little Paris green or buhach, when needful to suppress the currant worm, the effect being absence of mildew and a very satisfactory persistence of the foliage.

Peaches and plums were sprayed, April 10, with the apparent result of almost wholly preventing the leaf-curl of the former, while a later spray apparently suppressed the fungus usually fatal to the growth of serrate varieties of peach in this climate, their growth continuing healthy, with slight exception, through the season. It should be stated, however, that the effect of the use of copper and arsenical preparations is apparently cumulative, since a later spray with the same mixture, of less than half the usual strength, occasioned a very considerable loss of the older foliage of both peaches and plums.

Apples, pears, and quinces were sprayed repeatedly with reference to the double purpose of destroying the larvæ of the codlin moth, the scab of the apple, and the leaf-spot of the pear and quince.

The moth of the peach tree borer, while its eggs are usually deposited near the surface of the ground, manifests a preference for a position above a branch, when quite near the ground. For this reason it is the practice to branch the peach not lower than one and a half or two feet above the surface. In the case of other fruit trees, the preference is to branch very low, varying somewhat to accomodate the habit of the variety, whether spreading or upright.

Except in the case of small fruits, including the grape, by preference all pruning is done in early spring, before any movement of the sap, although pinching is often done during summer to stop the growth of misplaced shoots, or to check such as may be outgrowing their neighbors. Except in the cases of the grape and peach, with which pinching and thinning are already necessary, the time has scarcely yet arrived when these processes are needful to control fruitfulness, with the exception of perhaps a single variety of apple, the Keswick, which entirely escaped last year's injury of foliage and has required severe thinning this season, and has set a fine crop of fruit buds for the coming season's crop.

With the commencement of the growing season the date of the blooming and maturing of each variety is noted and recorded.

In the case of strawberries the sexuality of each variety is determined, while in bloom, and a record is kept of the date and weight of each picking, by means of which the beginning, duration, and end of the season of each variety, together with the amount of its product, are determined.

Twenty-six plants of each variety were grown, of which thirteen are kept in hills by the prompt removal of all runners, while the other thirteen are encouraged to form a matted row. These two sets of each variety are picked separately, and a separate record made of each, for the purpose of determining, in each case, by which process each may be made to yield the most desirable or profitable results.

It has been the purpose to adopt a similar plan in the case of other small fruits, but so far it has, from one cause or another, proved impossible to secure, in very many cases, the even and perfect stand of plants necessary to a reliable result. In the case of the tree fruits, many if not most of which are as yet not in full bearing, and owing to the depredations of insects and birds, the same difficulty exists. On account of such difficulty resort is had, in these cases, to estimates of comparative productiveness.

Many of the varieties selected for their superior quality are not profitable, commercially considered, while, of the new, trial varieties, scarcely one per cent. prove really valuable, and yet each must receive a modicum of the cultivation and watchfulness needed to determine its position in the scale of values. This circumstance, involving as it does extra expenditure of time and labor, must necessarily preclude the expectation of profit as a direct result of the enterprise, save that which inures to the public at large, from trustworthy results thus obtained instead of the questionable conclusions reached by individuals and liable to vitiation from the interests, real or imaginary, of those from whom they may have emanated.

Since no trustworthy comparison is possible, between a plantation of strawberries bearing its first crop and one with its second, it is the practice generally to plow under a plat after taking off one crop, the plat for the following year's fruiting having been planted the previous spring, although it may be found desirable, at some time in the future, to maintain a plat for a second year's crop, and to compare results from the first and second crops.

With the renewal of the plantation, such varieties (and they are generally a large majority) as, after sufficient trial, have not proved valuable, together with those already sufficiently tested, are omitted, save only such of the tested varieties as may be desirable for purposes of comparison, the varieties dropped giving place to other and generally more recent ones. Under this practice, the number of varieties which fruited in 1893 was 176, but is reduced to 160 in the plat for 1894.

The entire plantation, including about fifteen acres, is not yet full, space remaining for such varieties as may from time to time require testing, while in the case of the tree fruits (with the possible exception of peaches), trees of varieties not requiring further trial can be re-grafted with other and untested kinds, with a probability of hastening results.

As a means of indicating the present extent of operations, we give the number, in each class of fruits, already planted, there being in most cases two trees of each variety. Of apricots, 9 varieties, all being of the class known as Russian; apples, 189; apples, 24, imported from Hungary,

Europe, in scions, mostly in nursery; blackberries, 32; cherries, 60; cherries, 5, of the above importation from Hungary, yet in nursery; currants, 24; gooseberries, 18; grapes, 150; mulberries, 5, of those known as ever-bearing; nectarines, 2; nuts, 22; peaches, 177; pears, 80; plums, 95, including native, common (*domestica*), and Japanese; quinces, 10; raspberries, 19, including red and yellow; black-caps, 43, including black, purple, and yellow tip-rooting varieties; service berries, 3, all of the dwarf class; strawberries, 160.

Responding to a question, Mr. LEWIS said he used soft soap and sulphur in equal parts, making a sort of thick paint. It is equally good against borers as against vermin.

For the same purposes, Mr. MORRILL uses coarse hard soap, rubbed on after digging out the borers.

#### A BRIEF PAPER ON CELERY CULTURE.

The following brief paper on celery culture was submitted by Mr. JOSEPH DUNKLEY of Kalamazoo:

The best varieties are White Plume for summer and Giant Pascal for winter.

The sowing of seed for summer use should be begun early in March, in a properly constructed hotbed. Be sure to keep the celery growing, to avoid its going to seed. For late fall and winter use, the seed should be sowed in a well-enriched, moist situation, from April 1 to April 20. I would advise enriching the land very highly, say not less than one hundred loads of well rotted manure per acre, plowing it in properly.

Mark off your land in rows four feet apart, for summer crop or White Plume, five feet apart for winter or Giant Pascal. Planting may commence for summer and early fall use about May 10; for winter use, from June 10 to July 10.

White Plume is a very delicate variety, and I should advise using boards or paper for bleaching, as it discolors very easily. For late fall and winter use I would advise hilling with earth, to commence about Sept. 10. Celery for winter use will be much handsomer if it is hilled one month before it is stored.

The best way for storing is to put your celery in a trench not over one foot wide. Dig your celery and trim off all yellow or decayed leaves, and stand it up perfectly straight in the trench, drawing earth to the sides and to the top, and, as the winter advances, cover the top with three inches of marsh hay or straw.

We do all our hardest labor with horses.

#### THE QUESTION BOX.

Has any one grown the Champion, the Elberta, or the Diamond peach in this latitude?

Mr. MORRILL: I have fruited the Diamond. It is a clingstone of the Crawford type. If you want a clingstone you would better take an Old-mixon. I see nothing extra in the Diamond. I have not fruited the Cham-

pion, but others who have done so highly commend it. The Elberta is of the Crawford type also. It is a desirable variety. If it has a weakness it is in the direction of curl-leaf.

It is claimed that the Anjou pear is a shy bearer, while Ellwanger & Barry state that it is their most profitable sort. Can any one give the reasons for these contradictory statements?

MR. LEWIS: I have a small number of Anjou pears. Instead of being shy, they are very excellent bearers.

MR. ENGLE: If you wait long enough, they are enormous bearers, but you will get but few until the trees are fifteen years old.

MR. SMITH: I have one dozen Anjou trees, and they do not bear. It is said that another variety is needed close by to fertilize the Anjou blossoms.

MR. MORRILL: The Anjou bears well when old enough, bears heavily; all growers like it, but they have to wait.

Do we derive any benefit from fall and winter cultivation?

It advances spring work, but roots of fruit trees must not be disturbed. Be careful how it is done. It is good for currants, gooseberries, and peaches, if the land holds water. Plow very shallow, and toward the trees. Do the work late, so as not to start new growth in the autumn. It will work the leaves into the soil, and is detrimental to the cutworm.

What is the best material for posts, for grape trellises, all things considered?

Tamarack, and this is best when cut in August or thence into winter. Some such have lasted twenty-two years. Choose those showing least sap. About Lawton every sort of timber obtainable is used, but chiefly white oak, which is regarded as best.

Does it pay to throw barnyard manure on grape land?

MR. ENGLE puts only wood ashes on grapes. MR. STANTON, when setting, manures heavily, and has used some since, but the part of his vineyard receiving the manure later does not yield any better than the rest of it. Such manure does not harm, perhaps, he thought, but there is no need of it.

#### REPORT OF COMMITTEE ON RESOLUTIONS.

In accordance with the time-honored custom of the society, we desire to present the following resolutions:

*Resolved*, That the thanks of this society are due, and heartily given, to the citizens of Lawton, for their united, hearty welcome, and very large attendance at all the sessions of this meeting.

*Resolved*, That we extend a vote of thanks to the Lawton Chorus club, for their constant attendance and willingness to furnish us with delightful music, thereby adding greatly to the pleasure and interest of the meeting.

*Resolved*, That we feel very greatly indebted to the representatives of the Agricul-

tural college, without whose presence and aid our meetings would be shorn of very much of their usefulness.

*Resolved*, That we return friendly greetings to the members of the Illinois State Horticultural society for their kindly remembrance of us by sending their genial and practical representative, Mr. O. W. BARNARD.

*Resolved*, That the thanks and grateful feelings of the society are due and hereby tendered to our retiring officers, Prest. T. T. LYON and Treasurer S. M. PEARSALL, for their long, faithful, and useful labors in behalf of this society, thereby giving us a reputation second to none in the sisterhood of states.

C. A. SESSIONS,  
R. MORRILL,  
C. P. CHIDESTER.

#### REPORT OF COMMITTEE ON FRUIT EXHIBIT.

Your committee appointed to examine and pass upon the fruit exhibit, beg leave to report as follows:

Best collection of grapes, A. H. SMITH, \$5.00.

There being but one exhibit of apples, but it being considered worthy, the award was made to R. S. VAHUE, \$2.00.

We find also a creditable exhibit from T. T. LYON, not competing; and another from C. P. CHIDESTER, of new seedlings, which seems worthy of attention.

G. W. BARNARD,  
O. BEEBE,  
R. J. CORYELL.

This concluded the programme, and the society, with much regret that there was no more time, adjourned *sine die*.

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FRUIT CATALOGUE

OF THE

MICHIGAN STATE HORTICULTURAL SOCIETY

FOR

1894-5.

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# FRUIT CATALOGUE, 1894-5.

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## INTRODUCTION.

The fruit catalogue of this society is practically the creation of its late president, the Hon. T. T. LYON, who, as chairman of the committee on its revision, has done most of the work of rearranging it from year to year. It was with much reluctance that the writer took hold of it, and it was only from the fact that President LYON positively declined to serve longer as chairman of the committee. He consented, however, to remain upon the committee, and his assistance has been invaluable in carrying out the work.

As in previous years, many varieties were found in the catalogue which had entirely gone out of use, while others seemed unworthy of a place upon the list. Believing that the list was much too large for the average grower, they have been left out of the present catalogue, but have been placed as appendix at the end of the approved list. In the previous catalogues a similar plan has been followed, but the rejected sorts of each year have been kept by themselves. Believing it to be more convenient for reference, the rejected varieties of each of the different kinds of fruits have been grouped together, in alphabetical order, followed by the date at which they were rejected. This admits of the finding of any desired variety at once, and if a description of the variety is desired it can be found in the list issued two years previous to its rejection.

With the above exceptions few changes have been made in the list beyond the addition of such varieties as have come to the front since the last catalogue was issued.

The following persons are the members of the committee on the revision of the fruit catalogue, and have rendered efficient aid by the suggestions they have made: T. T. LYON, South Haven; A. A. CROZIER, Ann Arbor (now Agricultural College); D. G. EDMISTON, Adrian; W. A. SMITH, Benton Harbor, and C. A. SESSIONS, Mears. In addition to the above assistance I had at my disposal and used in preparing the catalogue the reports obtained in 1893 from a large number of fruit growers, when engaged in revising the list of the American Pomological Society.

In preparing this list, errors have without doubt crept in, and, that they may be corrected in future lists, any person who notices any rating that is incorrect for a given locality is urged to inform the writer.

L. R. TAFT,

*Chairman of Committee on Revision of Catalogue.*

*Agricultural College, April, 1894.*

## ARRANGEMENT OF THE CATALOGUE.

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In making the present revision few radical changes have been made and the same plan of arrangement has been used; in fact with an occasional note the explanations given for the last catalogue would apply to the present one.

So many improvements have been made, particularly in small fruits, that the starring has been considerably altered.

Each variety is given a number in the column at the left and this is repeated on the opposite page to prevent mistakes in carrying the variety across. In the columns given up to the descriptions of the varieties, the usual abbreviations are used, the explanations for which are given at the head of each section. As in previous lists the columns headed "Use and value" show on a scale of 1 to 10 the value of the fruits for the different purposes, but attention is called to the fact that, in the sub-columns headed "Dessert" and "Cooking" the quality of the fruit and its adaptation to the purpose alone are considered, without regard to the productiveness and other characteristics of the varieties.

In the third column under "Market" all of the qualities which go to make a variety profitable for market are considered. If a variety stands high in the "Market" column and has a mark in either the "Dessert" or "Cooking" that will bring the total to fifteen or over, it indicates that it is a valuable one for home use for the purpose noted.

From the fact that a variety does not prove equally valuable in all parts of the State, the columns under "Locality" are arranged to show by means of symbols their value in the various sections. When two stars (\*\*) are given, it shows that the variety is very generally successful and that it is one of the most desirable kinds for planting. When one star (\*) is used, the variety is one that has much merit, but it is less valuable under most conditions than those of the first class; there are also many sorts which do well in some localities, but which are not generally successful and at any rate are of less value than those given one star; these we have marked with a star (\*) followed by an interrogation point (?) to indicate that they are at best of doubtful value.

To show the sorts that are of even less value, but which have been found profitable in some localities and for some purposes, we have included them in the list, but have left the columns which show their value in the different sections of the State blank. In using the list, one should select the sorts that bear two stars, if only a few kinds are wanted, and, if a longer

list is desired, the kinds that have the highest marks in the columns of "Use and value" can be drawn from to complete the number, those with one star being as a rule most likely to succeed.

We have also included in the list quite a number of new sorts that seem to be especially promising, and have marked each of them with a dagger (†).

In dividing the State into districts for the sub-columns we have followed the previous lists and have grouped the counties of the lower peninsula into sections as follows, viz.: first district, the eastern tier of counties; second, the central counties of the State, omitting the row of counties along the east, south and west sides; third district, the counties along the south border of the State from Lenawee to Cass; fourth district, the counties bordering Lake Michigan from Berrien to Muskegon inclusive; fifth district, from Muskegon county northward along the lake shore. In reality the eastern district does not extend much above Bay county, although many of the hardier fruits can be grown with success even to the north of Alpena, while the Central district can not be relied upon for the tender fruits for the counties north of Gratiot.

As will be seen from the rejected list that is placed at the end of the regular catalogue, a large number of sorts have been excluded. Many of them have shown themselves unworthy to be longer carried in the regular list, while others have considerable value and have for a long time been known, but hardly a tree can be found in the State, and, moreover, they are not offered by any of the nurserymen. By rejecting them we are able to reduce the number of sorts mentioned in the catalogue and thus lessen the confusion that a long list makes for many persons. The foreign grapes and nectarines are so little grown that it was thought well to leave them out, especially as no changes would have been made in the last list.

#### NOMENCLATURE.

The nomenclature used in this revision is in accordance with the "Rules of Pomology" of the American Pomological Society, and several changes have been made that bring the list in harmony with the names recommended by the Division of Pomology of the Department of Agriculture.

## FRUIT CATALOGUE FOR 1894 AND 1895.

## ABBREVIATIONS, APPLICABLE THROUGHOUT THE CATALOGUE.

Size.  
l. large.  
m. medium.  
s. small.  
v. very.

Quality.  
b. best.  
g. good.  
v. very.

Adhesion.  
c. cling.  
f. free.

## SECTION I.—APPLES.

## ABBREVIATIONS FOR THIS SECTION.

## Form.

a. angular.  
c. conical.  
f. flattened.  
l. lop sided or oblique.

o. oblong.  
ob. oblate or obtuse.  
ov. oval or ovate.  
r. roundish.

Number.	Names.	Description.						Use and value. Scale 1 to 10.		
		Size.	Form.	Color.	Quality.	Season.	Origin.	Dessert.	Cooking.	Market.
1	Alexander .....	v l	r c	g y r	g	Oct. Dec.	Rus.	2	10	6
2	American Golden Russet .....	s	r ov	y ru	b	Oct. Jan.	Am.	9	6	2
3	Autumn Swaar .....	l	r c	o y ru	v g	Sept.	Am.	7	7	4
4	Autumn Bough .....	m	ca	y	v g	Aug. Oct.	Am.	5	5	2
5	Bailey Sweet .....	l	r c	y dr	v g	Nov. Mar.	N. Y.?	6	7	4
6	Baldwin .....	l	r c	y cr o	v g	Nov. Mar.	Mass.	7	9	10
7	Belmont .....	m	r f c	y v	v g	Nov. Mar.	Penn.	9	6	6
8	Ben Davis .....	m l	r c	y r	g	Dec. May.	Ken.?	3	5	9
9	Benoni .....	m s	r ob c	y d c	v g	Aug. Sept.	Mass.	7	6	5
10	Black Gilliflower .....	m	o c	g dr	g	Nov. Feb.	Am.	4	2	4
11	Blenheim .....	l	r ob c	y od r	g	Oct. Dec.	Eng.	5	7	6
12	Blue Pearmain .....	l	r c	d pr	g	Oct. Feb.	Am.?	6	5	4
13	Bough, <i>Large Yellow Bough</i> .....	l	o ov	g y r	v g	Aug.	Am.	8	7	6
14	Broadwell .....	m	ob c	y b	v g	Nov. Feb.	Ohio.	7	7	4
15	Buckingham .....	m l	ob c	g y cr	v g	Nov. Feb.	Vir.?	6	5	5
16	Buffington .....	m	ob	y w r	v g	Aug.	Penn.	7	5	3
17	Cabashea, <i>20-oz. Pippin</i> .....	v l	r ob c	y r	g	Dec. Feb.	Am.	1	4	1
18	Canada Reinette .....	l	ob c f	g y b	v g	Dec. Apr.	Eur.?	5	4	2
19	Chenango .....	m l	o c	w c	v g	Sept. Oct.	N. Y.	9	7	8
20	Clyde .....	l	r ca	g r	g	Oct. Jan.	N. Y.	5	5	6
21	Cogswell .....	m l	r ob	y r	b	Dec. Mar.	Conn.	8	7	8
22	Cole Quince .....	l	r ob	g y r	v g	Oct. Dec.	Maine.	6	8	6
23	Colvert .....	l	ob c	g y r	g	Oct. Nov.	N. Y.?	4	7	7
24	Cooper .....	l	r ob	g y r	g	Oct. Dec.	Am.?	4	6	7
25	Cooper Market .....	m	ob c	y r c	g	Dec. Mar.	Am.?	4	6	6
26	Cornell .....	m	o c	y c	v g	Oct. Nov.	Penn.	7	6	6
27	Cranberry Pippin .....	m	r ob	y s	g	Nov. Mar.	N. Y.	5	7	6
28	Danvers .....	m	r o	y o	v g	Nov. Apr.	Mass.	5	7	5
29	Domine .....	m	r ob	g y r	v g	Dec. Apr.	Am.?	6	6	6
30	Dyer, <i>Pomme Royal</i> .....	m	r	g y r	b	Sept. Oct.	Fr.?	8	6	4

## FRUIT CATALOGUE FOR 1894 AND 1895.

## ABBREVIATIONS APPLICABLE THROUGHOUT THE CATALOGUE.

Season.		Origin.	
The usual abbreviations for months.	b. beginning. e. end. m. middle.	The usual abbreviations for countries.	h. hybrid. ?. doubtful.

## SECTION I.—APPLES.

Color.	
b. brown. c. carmine. cr. crimson. d. dark. g. green.	o. orange. p. purplish. r. red. ru. russet. s. scarlet. v. vermillion. w. whitish. y. yellow.

Number.	Locality.					Remarks.
	East.	Center.	South.	Southern lake shore.	Northern lake shore.	
1	*	*	*	*	*	Tree vigorous, spreading, productive; very beautiful. For cooking, superior.
2	*	*	*	*	*	Better farther south. Tree upright. Fruit often scabby and worthless.
3	*?	*?	*?	*?	*?	Hardy, vigorous, spreading. Excellent, but not productive enough for the market.
4	*	*	*	*	*	One of the best dessert sweet apples of the season.
5	*	**	*	*	*	For vigor, productiveness, size, beauty and quality combined, this has few if any superiors.
6	**	**	**	**	*	Tree lacks hardiness. Fruit drops badly. Bitter rot in large specimens.
7	*	**	*	*	*	Stands first on light soils in southern Michigan.
8	*	**	*	**	*	Fruit often defective in this climate. Best for home markets. Suits the popular taste.
9	*?	*?	*	*	*?	Vigorous, hardy, prolific. Fruit beautiful and handles well, but very poor in quality. Sells well in the market.
10	*?	*?	*?	*?	*?	Tree upright, vigorous, very productive. Fruit too small on old trees.
11	*?	*?	*?	*?	*?	Very mild flavor. Soon gets dry and mealy. Prized by a very few persons.
12	*?	*?	*?	*?	*?	In vigor and productiveness, also character of fruit, this is very desirable for market and cooking.
13	*?	*?	*?	*?	*?	Beautiful; but lacks both productiveness and quality.
14	*	*	*	*	*	Tree a little tender. A favorite early sweet apple.
15	*	*	*	*	*	Vigorous, hardy, spreading, irregular, productive. A desirable sweet apple.
16	*?	*?	*?	*?	*?	Little grown here. More popular farther south.
17	*?	*?	*?	*?	*?	A desirable dessert apple. Not as generally known as it deserves to be.
18	*?	*?	*?	*?	*?	Tree vigorous; tender; thin bearer; drops badly. Poor quality. Subject to bitter rot.
19	*	**	**	*	*	An old and often excellent apple; but now little called for.
20	*?	*?	*?	*?	*?	Tree vigorous, spreading, productive. Fruit of very delicate texture. Popular wherever known.
21	*?	*?	*?	*?	*?	Tree vigorous, upright, very productive. A desirable market apple.
22	*?	*?	*?	*?	*?	The tree and fruit are both satisfactory, whether for the home or market.
23	*?	*?	*?	*?	*?	Upright, spreading, productive. A desirable family fruit with a quincearoma.
24	*	*	*	*	*	Tree vigorous, hardy, prolific. Fruit large, showy, but not of high quality.
25	*?	*?	*?	*?	*?	Popular with the masses. Sells well in market.
26	*?	*?	*?	*?	*?	Tree very vigorous, upright, spreading. Fruit even sized, very attractive.
27	*?	*?	*?	*?	*?	Hardy, vigorous, upright, productive. Profitable.
28	*?	*?	*?	*?	*?	Vigorous, productive. A desirable fruit for general purposes.
29	*	*	*	*	*	Tree a good grower, productive. Fruit much like the Maiden's Blush. Even more beautiful. Worthless at the extreme north.
30	*?	*?	*?	*?	*?	Strong grower and very productive. Deserves more attention.
	*?	*?	*?	*?	*?	Tree has long, stout, spreading branches, which are very liable to be broken by the heavy crops of fruit. Scabs on old trees.
	*?	*?	*?	*?	*?	One of the very finest dessert apple. A poor grower. Unprofitable as a market fruit.

## SECTION I.—APPLES.—CONTINUED.

Number.	Names.	Description.						Use and value. Scale 1 to 10.		
		Size.	Form.	Color.	Quality.	Season.	Origin.	Desert.	Cooking.	Market.
31	Early Harvest .....	m	r ob	y w	b	July Aug.	N. Y.?	7	7	5
32	Early Joe .....	s	ob c	y r	b	Aug. Sept.	N. Y.	8	6	4
33	Early Strawberry .....	e	r c	y r	v g	July Aug.	N. Y.	8	6	7
34	English Russet .....	s m	r c	g y ru	g	Jan. May.	Am.?	4	5	6
35	Esopus .....	m	o c	y r	b	Dec. Apr.	N. Y.	7	8	4
36	Fallawater .....	v l	r c	y g r	g	Nov. Mar.	Penn.	4	7	7
37	Fall Jenetting .....	l	ob c	g y r	g	Sept. Oct.	Conn.?	5	4	4
38	Fall Orange .....	l	r	y r	g	Oct. Nov.	Mass.	4	8	8
39	Fall Pippin .....	v l	r f	y g b	b	Oct. Dec.	Am.	8	9	7
40	Fall Wine .....	m	r ob	r y	b	Sept. Nov.	Am.	7	6	4
41	Fameuse, <i>Snow</i> .....	m	r ob	g y r	v g	Oct. Nov.	Can.?	9	6	7
42	Flushing .....	m	r c	g y r	g	Nov. Mar.	N. Y.?	6	6	7
43	Garden Royal .....	m s	r ob c	g y r	b	Aug. Sept.	Mass.	9	5	4
44	Garrettsen .....	m	r c	y r	v g	Sept.	N. J.	6	6	6
45	Genesee .....	l	r c	w cr	g	Sept.	Am.	6	6	5
46	Gilpin, <i>Carthouse</i> .....	m	r o	r y	g	Dec. May.	Vir.	5	4	5
47	Gloria Mundi .....	v l	r ob	g y	g	Oct. Feb.	Eur.?	3	5	5
48	Golden Russet (W. N. Y.) .....	m s	r ob	y ru	v g	Dec. May.	Eng.?	9	6	8
49	Golden Sweet .....	l	r	g y	g	Aug. Sept.	Conn.	6	5	6
50	Golding ( <i>Am. Golden</i> ) .....	m l	r ob c	y b	v g	Nov. Feb.	Am.	7	7	5
51	Gravenstein .....	l	r ob a	y r o	v g	Sept. Oct.	Ger.	7	7	8
52	Green Newtown .....	m	r	g br	b	Dec. May.	N. Y.	10	8	8
53	Green Sweet .....	m	r ob c	g y	g	Dec. Mar.	Mass.?	7	6	7
54	Grimes Golden .....	m	r o c	y o	v g	Dec. Mar.	Va.	9	7	8
55	Hartford Sweet .....	l	r f	y g r	g	Dec. June.	Conn.	6	7	4
56	Haskell Sweet .....	m l	ob	g y r	v g	Sept. Oct.	Mass.	6	7	2
57	Hawley, <i>Dowse</i> .....	l	r o c	y	v g	Sept.	N. Y.	7	5	5
58	Hawthornden .....	m l	r f	w y r	g	Sept.	Scotch.	3	8	8
59	Hightop Sweet .....	m s	r	y	v g	Aug.	Mass.	6	6	5
60	Hubbardston .....	l	r o c	y r	b	Nov. Feb.	Mass.	10	5	9
61	Jabez Sweet .....	m	r c	y	g	Dec. Feb.	Conn.	6	7	3
62	Jeffers .....	m	ob c	y cr	v g	Sept. Oct.	Penn.	9	6	7
63	Jersey Sweet .....	m	r ob c	g y r	v g	Sept.	N. J.	8	7	6
64	Jonathan .....	m s	r c	y r	v g	Nov. Feb.	N. Y.	9	7	9
65	Keswick .....	m l	ov c	g y r	g	Sept. Oct.	Eng.	2	10	8
66	Lady .....	v s	f	y r	v g	Dec. May.	Fr.	8	1	5
67	Lady Sweet .....	l	r ov c	y r	v g	Dec. May.	N. Y.	7	7	7
68	Late Strawberry .....	m	r c	w r	v g	Oct. Dec.	N. Y.	8	4	5
69	Limber Twig .....	m	r ob	y r	g	Jan. Apr.	N. C.?	5	7	8
70	Lowell .....	l	r ov c	g y	v g	Sept. Oct.	Penn.?	7	7	8
71	Lyscom .....	l	r	g y r	g	Sept. Nov.	Mass.	7	3	5
72	Maiden Blush .....	m	r f c	y r cr	g	Sept. Oct.	N. J.	7	8	10
73	Mann .....	m l	r ob	y br	v g	Jan. Apr.	N. Y.	6	7	9
74	Manomet .....	m	r ob	y r	v g	Aug. Sept.	Mass.	7	7	4
75	McLellan .....	m	r ob	y r	v g	Dec. Mar.	Conn.	9	7	8
76	Melon .....	m l	r ob c	y cr c	b	Nov. Mar.	N. Y.	10	8	7
77	Mexico .....	m	r ob	cr r y	b	Sept. Oct.	Conn.	10	6	5

## SECTION I.—APPLES.—CONTINUED.

Number.	Locality.					Remarks.
	East.	Center.	South.	Southern lake shore.	Northern lake shore.	
31	*	*	*	*	*	Tardy, irregular bearer. Fruit often imperfect. Valued mainly for its earliness. Fails on old trees.
32	*	*	*	*	*	For the garden. With high culture the fruit is beautiful and excellent.
33	*	**	*	*	*	One of the most attractive dessert apples of its season. Ripens in succession. By some considered profitable.
34	*?	*?	*?	*?	*?	Strong, upright, very productive, tender. Fruit very even sized, often small. Keeps easily a year. Poor quality.
35	*?	*?	*?	*?	*?	Tree lacks vigor. Fruit much called for in the market, but rarely offered. Best on rich, warm soils.
36	*	*	*	*	*	Grows and produces well. Too poor in quality. Size its chief recommendation. Always sells well.
37	*?	*?	*?	*?	*?	Tree vigorous, spreading, productive. Its season and color detract from its value.
38	*	---	*	---	---	The apple grown in this State under this name proves to be the one known as "Newell" in Hillsdale county.
39	*	*	*	*	*	Tree strong, spreading, productive; liable to scab. Often keeps till spring. In central district lacks productiveness.
40	---	---	---	---	---	Grows and bears well. Fruit often scabby. Not extensively grown.
41	*	*	*	*	*	Fruit scabby and imperfect on old trees. Best on new, rich soils. Good at the north. Profitable where it succeeds.
42	*	*	*	*	*	Strong, reddish brown shoots. Very productive. Sometimes scabby. Not esteemed valuable, except perhaps at the north.
43	*	*	*	*	---	Moderate grower. Upright, roundish. Best dessert apple of its season.
44	*?	*?	*?	*?	*?	Vigorous, upright, spreading. Very promising.
45	---	---	---	---	---	Strong, vigorous. The showy fruit is the chief attraction.
46	---	---	*?	*?	---	A good cider apple, and passable for the table.
47	---	---	---	---	---	Vigorous; not productive. Size its only attraction. Worthless everywhere.
48	**	**	*	*	*	Hardy, vigorous. Shoots slender. Very productive. Brings a high price in late spring, if wintered in close packages.
49	*?	*?	*?	*?	*?	A hardy, spreading, prolific tree. Very popular in its season. Tree tender at the extreme north. Often fed to stock.
50	*?	*?	*?	*?	---	An old sort; superior to many better known.
51	**	**	*	*	**	A fine culinary fruit. Tree a fine grower and hardy; lacks productiveness. Bears better at the north.
52	*?	*?	*?	*?	*?	A weak, slender grower. Fails generally at the west. Unprofitable. Best on "opening" soils.
53	*	*	*	*	---	Tree vigorous, productive. Desirable. More than one variety grown under this name.
54	*	**	**	**	*	Tree spreading, vigorous, hardy, prolific. Fruit beautiful. Flavor fine, peculiar.
55	---	---	---	---	---	Moderate grower, hardy, productive. A good baking sweet apple.
56	*	*	*	*	**	Vigorous, productive. One of the finest of sweet apples.
57	*?	*?	*?	*?	*?	Annual bearer. Fruit beautiful and good, but soon decays. A dessert fruit. A better keeper north.
58	*?	*?	*?	*?	*?	Tree vigorous, spreading. Productive alternate years. A beautiful culinary market fruit.
59	*?	*?	*?	*?	---	Tree upright, vigorous. Very productive. Fruit very beautiful and good.
60	**	**	**	**	**	Should be in every orchard. A very good market variety. Of the highest quality.
61	*?	*?	*	*?	*?	Highly prized in Monroe county. Not widely disseminated.
62	*	*	*	*	*	A very productive and desirable dessert fruit for early autumn.
63	*	*	*	*	*	Prolific. One of the richest early sweet apples. Tree tender in central districts.
64	**	**	**	**	**	Good bearer alternate years. Fruit small, very beautiful and good. Popular.
65	*	**	**	**	*	Cooks well, even when but half grown. Very early bearer. Very hardy and prolific.
66	*?	*?	*?	*?	*?	A beautiful little fancy apple. Brings large prices in market in eastern cities. Little known west. Sometimes scabs.
67	*?	*?	*?	*?	*?	A fair baking apple. Desirable as a long keeper. Retains its juice and flavor.
68	*	*	*	*	*	Regular, early bearer. Chenango is often grown under this name.
69	*?	*?	*?	*?	*?	Popular west and south as a long keeper. Distinct from Willow Twig.
70	*	*	*	*	*	Strong grower, bears heavily in alternate years. Popular. Profitable.
71	*	---	---	---	---	Generally fair. Tree vigorous, upright, spreading. Not largely planted.
72	**	**	*	**	**	Spreading, vigorous, prolific. The most popular early autumn market apple. Rather acid for dessert.
73	*	*	*	*	*	Hardy, upright, annual bearer. Not much disseminated. A long keeper.
74	*	*	*	*	---	Vigorous, productive. Fruit excellent. Worthy of increased attention.
75	*	**	*	*	---	Thrifty, upright, productive. An excellent variety for home and market. Bears alternate years.
76	*	**	*	*	*	One of the very best dessert apples. Tree hardy, with short, wiry shoots. Very productive alternate years.
77	*?	*?	*?	---	---	Moderate grower, hardy, productive. One of the finest of dessert apples.

## SECTION I.—APPLES.—CONTINUED.

Number.	Names.	Descriptions.						Use and value. Scale 1 to 10.		
		Size.	Form.	Color.	Quality.	Season.	Origin.	Desert.	Cooking.	Market.
78	Milam .....	m s	r	g r	g	Dec. Mar.	Am.	5	8	5
79	Miller (N. Y.) .....	l	o ob c	y r	v g	Oct. Nov.	N. Y.?	7	6	5
80	Minister .....	l	o c	g y r	g	Oct. Feb.	Mass.	6	7	7
81	Monmouth .....	l	ob c a	y r	v g	Nov. Mar.	N. J.	6	7	9
	<i>Red Cheek Pippin.</i>									
82	Morris Red .....	m l	ov c	r ru	v g	Jan. Apr.	Conn.?	8	8	7
	<i>Steele's Red erroneously.</i>									
83	Mother .....	m	r c	y r	b	Nov. Feb.	Mass.	7	6	7
84	Munson Sweet .....	m	ob	y r	v g	Sept. Feb.	Mass.?	6	7	7
85	Newtown Spitzenburg .....	m	ob c	y r	b	Oct. Feb.	N. Y.	9	7	5
	<i>Vandevere of N. Y.</i>									
86	Northern Spy .....	l	r c	g y r	b	Dec. Apr.	N. Y.	10	9	10
87	Oakland .....	m	r ob	y r	v g	Nov. Mar.	Mich.?	8	7	8
88	Oconee .....	l	r f	y b	g	Nov. Dec.	Ga.	6	6	7
89	Ohio Nonpareil .....	l	r ob	y r	v g	Nov. Dec.	Ohio.?	8	9	9
90	Oldenburgh .....	m	r ob	y r	g	Sept.	Rus.	5	9	9
91	Paw Paw, <i>Rubicon</i> .....	m	r o	y r	v g	Dec. June.	Mich.	9	5	5
92	Peach Pond Sweet .....	m	ob	y r	v g	Sept. Nov.	N. Y.	6	6	6
93	Peck Pleasant .....	m l	r f	g y r	v g	Nov. Mar.	R. I.?	9	8	9
94	Pennock .....	l	r f l	r y	g	Nov. Mar.	Penn.	1	1	5
95	Perry Russet .....	m	r c l	y ru b	g	Nov. Dec.	N. Y.	6	6	5
96	Pewaukee .....	m l	r ob	r y	g	Dec. Apr.	Wis.	7	8	8
97	Pomme Gris .....	s	ob r	ru r	b	Dec. Mar.	Ear.?	10	6	5
98	Porter .....	m l	o c	y r	v g	Sept.	Mass.	8	7	8
99	Primate .....	m	r ob c	g w cr	v g	Aug. Oct.	N. Y.?	10	5	6
100	Pumpkin Sweet, <i>Pound Sweet</i> .....	v l	r	w g y	g	Sept. Dec.	Conn.?	2	8	4
101	Rambo .....	m	r ob	y w r	v g	Oct. Feb.	N. J.?	8	5	5
102	Ramedell Sweet, <i>English Sweet</i> .....	m l	o c	d r	v g	Oct. Feb.	N. E.?	6	9	4
103	Rawle Janet .....	m l	ob c	y r cr	g	Feb. June.	Vir.	3	1	5
104	Red Astrachan .....	m l	r c	g y cr	g	Aug.	Rus.	5	9	10
105	Red Canada, <i>Old Nonsuch</i> .....	m	r ob c	y r cr	v g	Dec. June.	N. E.?	9	8	10
106	Red June .....	s	ov c	d r	v g	Aug.	N. C.?	7	6	2
107	Red Russet .....	m l	r c	y r ru	v g	Jan. Apr.	N. H.	8	7	5
108	Ribston .....	m	r c	y r ru	v g	Nov. Apr.	Eng.	7	7	4
109	Rhode Island Greening .....	l	r ob	g y r	v g	Nov. Apr.	R. I.?	9	10	9
110	Roman Stem .....	m	r	y b ru	v g	Nov. Mar.	N. J.	7	7	4
111	Rome Beauty .....	l	r c	y r	g	Nov. Feb.	Ohio.	6	7	5
112	Roxbury Russet .....	m l	r ob a	y ru r	v g	Jan. June.	Mass.	6	9	7
113	Shiawassee .....	m	ob	w r	v g	Oct. Jan.	Mich.	10	6	8
114	Smith Cider .....	m l	r ob c	y r	g	Dec. Mar.	Penn.	5	4	7
115	Smokehouse .....	m l	r ob	y cr	g	Sept. Feb.	Penn.	5	7	8
116	Sops of Wine .....	m	r	y r	g	Aug. Sept.	Ear.	4	6	6
117	Stark .....	l	r c	g y r	g	Jan. May.	Ohio.?	6	7	8
118	St. Lawrence .....	l	ob c	y c	v g	Sept. Oct.	Can.?	8	8	9
119	Summer Hagloe .....	l	r ob	w y r	v g	Aug. Sept.	N. J.?	6	7	7
120	Summer Pearmain .....	m	o	y r	b	Sept.	Am.	10	5	5
	<i>American Summer.</i>									
121	Summer Pound Royal .....	l	r ob c	g w	g	Aug. Sept.	Am.	6	8	7
122	Summer Queen .....	l	r c	y r	g	Aug. Sept.	N. Y.?	6	7	6

## SECTION I.—APPLES.—CONTINUED.

Number.	Locality.					Remarks.
	East.	Center.	South.	Southern lake shore.	Northern lake shore.	
78	*2	*2	*2	---	*2	A hardy and somewhat popular apple farther west. Not common in Michigan. Vigorous, productive. A promising fruit for market and general purposes. Moderately vigorous, very productive. Not widely disseminated. Vigorous, upright, productive. Is a good market variety.
79	*2	*2	*2	---	---	
80	*2	*2	*2	*2	---	
81	*2	*2	*2	*2	---	
82	*2	*2	*2	*2	---	Vigorous, stocky; leaves large. Buds prominent. May be an old variety. Also known in Fulton county, Ohio.
83	*	*	*	*	*	Productive. An excellent dessert apple. Deserves more attention.
84	*	*	*	---	*	Tree spreading, vigorous, prolific. Fruit very perfect, even sized, and beautiful.
85	*2	*2	*2	*2	---	Requires warm soils. Sometimes scabs or cracks. One of the best apples when perfect.
86	**	**	**	**	**	Strong, upright, hardy. Tardy bearer. Fruit sometimes uneven and imperfect. Requires good culture and careful handling.
87	*	*	*	*	*	Popular in Oakland county. Less disseminated elsewhere.
88	*2	---	---	---	---	A vigorous, hardy, southern apple. Does well in eastern Michigan.
89	*	**	*	*	**	Very vigorous, productive. One of the most valuable late autumn apples.
90	**	**	**	**	**	Hardy, vigorous, very productive. Of little value except for cooking and market. Sells well, but soon decays.
91	*2	*2	*2	*2	*2	Hardy, moderate grower, regular bearer. Must have suitable soil and good culture.
92	---	---	---	---	---	Tree vigorous, spreading, productive. A beautiful and desirable sweet apple.
93	*	*	*	*	*	Habit of tree like R. I. Greening, but less vigorous. Generally and deservedly popular. Fruit beautiful and excellent.
94	---	---	---	---	---	Sometimes profitable to ship south. Poor flavor. Very subject to bitter rot.
95	*2	*2	*2	*2	*2	Distinct from Golden Russet. An early, abundant bearer. More than one variety is probably grown under this name.
96	*	*	*2	*2	*	Hardy and productive.
97	*2	*2	*2	*2	*2	Moderate, upright grower. Good early bearer. An excellent fine dessert apple. Less successful on light soils.
98	*	**	*	*	*	Usually very fair. Valuable for market as well as dessert.
99	*	**	**	**	*	One of the best dessert apples. Subject to water core and other defects. Ripens in succession.
100	*2	*2	*2	*2	*2	Tree strong, upright, spreading. Fruit often water cored. Culinary.
101	*	*2	*2	*	*2	A vigorous but tender tree. Overbears and produces small fruit. A very common farmer's apple.
102	*	*	*	*	*	Very vigorous and productive. Best sweet apple of its season for cooking and market.
103	---	---	---	---	---	Hardy, vigorous, spreading. Better farther south. Blossoms late.
104	**	**	**	**	**	Strong grower; early bearer; hardy. Fruit beautiful; showy; profitable; too soon for dessert.
105	**	*	*	**	**	Very popular for market where fully proved. Tree not vigorous. Should be top-grafted in all cases. Best on strong soils.
106	---	---	---	---	---	Often small, scabby and imperfect. Quality excellent. Ripens in succession. Better farther south.
107	*2	*2	*2	*2	*2	Tree much like Baldwin. The same true of fruit except the russet, and higher flavor.
108	*2	*2	*2	*2	*2	Tree a good grower, productive. High, sharp flavor. Succeeds at the north.
109	*	**	*	**	**	Tree spreading, vigorous; generally productive on strong soils; best at lake shore. One of the old favorites.
110	---	---	---	---	---	Moderately vigorous, spreading. Very productive. Not very much known in this State.
111	*2	*2	*2	*2	*2	Moderate grower, productive. Inclined to overbear on old trees.
112	*	*	*	*	*	Very liable to attacks of the codling moth. Tree strong, spreading, productive, tender. Not profitable on light soils.
113	**	**	**	**	**	Tree hardy, vigorous, upright, spreading, productive. Like Fameuse, but superior to it.
114	*2	*2	*2	*2	---	Very productive, vigorous, straggling. Valued for market purposes.
115	*2	*2	*2	*2	*2	Vigorous, spreading, productive. Culinary, market.
116	*2	*2	*2	*2	*2	Tree vigorous, upright, productive. Widely disseminated, but not valuable.
117	*	*	*	*	*	Tree vigorous, hardy, productive. Fruit good enough to sell. Valued as a market fruit.
118	*	*	*	*	*	Tree very vigorous, productive. Highly and justly valued. Sometimes cracks and scabs.
119	*2	*2	*2	*2	*2	Vigorous, productive. An old and useful culinary variety.
120	*2	*2	*2	*2	*2	Slow grower, hardy. Fruit, when perfect, mild, rich, excellent. Very beautiful.
121	---	---	---	---	---	Very vigorous. Productive. A profitable market apple for its season.
122	*2	*2	*2	*2	*2	Liable to scab. One of the best cooking apples. Popular.

## SECTION I.—APPLES.—CONCLUDED.

Number.	Names.	Descriptions.						Use and value. Scale 1 to 10.		
		Size.	Form.	Color.	Quality.	Season.	Origin.	Desert.	Cooking.	Market.
123	Summer Rambo, <i>Rambour</i> .....	l	ob	g y r	g	Sept.	Fr.	6	8	6
124	Summer Rose.....	s	r	y r	b	Aug.	N. J.	10	7	5
125	Summer Paradise.....		r f	g y	v g	Aug. Sept.	Penn.	9	7	4
126	Sutton.....	l	r ov	y r	v g	Dec. Feb.	Mass.	9	8	9
127	Swaar.....	l	r ob	y ob	b	Dec. Apr.	N. Y.	10	6	4
128	Sweet Bough..... <i>Large Yellow Bough.</i>	l	o ov	g y r	v g	Aug.	Am.	8	7	6
129	Talman Sweet.....	m	r	w y r	v g	Nov. Apr.	R. I.	6	8	6
130	Tetofski.....	m	r ob c	y r	g	Aug.	Rus.	5	7	---
131	Tewksbury.....	s	ob	y r	v g	Jan. July.	N. J.	7	7	5
132	Thaler.....	l	r ov	l y	g	Sept.	Rus.	7	---	---
133	Tompkins King.....	l	r f c a	y r c r	v g	Dec. Mar.	N. J.?	8	6	8
134	Titovka ( <i>Titus</i> ).....	l	r ob							
135	Townsend.....	m	ob c	y r	g	Aug. Sept.	Penn.	6	6	7
136	Trenton Early.....	m l	r ov	y r	g	Aug.	Am.?	6	6	8
137	Twenty Ounce..... <i>Cayuga Red Streak.</i>	v l	r	g y r	g	Oct. Jan.	Conn.	5	7	9
138	Vandevere.....	m	ob	y r	g	Nov. Mar.	Del.	6	8	9
139	Wagener.....	m	r ob	y c r	v g	Nov. Mar.	N. Y.	9	6	6
140	Washington Strawberry.....	l	r c f	y r	v g	Sept. Oct.	N. Y.	7	7	8
141	Wealthy.....	m	r ob	y c r	v g	Autumn.	Minn.	8	6	8
142	Westfield.....	m l	r c	g r r u	b	Oct. Mar.	Conn.?	9	5	7
143	White Pippin.....	l	r ob l	g w y	v g	Jan. Apr.	Am.?	6	7	5
144	Williams.....	m	r oc	r	g	Aug. Sept.	Mass.	6	5	7
145	Willow Twig, <i>James River</i> .....	m	r c	y r	g	Dec. May.	Vir.	5	7	7
146	Wine, <i>Hays Winter</i> .....	m l	r f	d r y	g	Oct. Mar.	Del.	7	7	6
147	Winesap.....	m	r ob c	d r y	v g	Nov. May.	N. J.	6	6	4
148	Yellow Bellflower.....	v l	o c	g y r	v g	Dec. Mar.	N. J.	8	10	7
149	Yellow Newtown.....	m	r ob l	y r	b	Dec. May.	N. Y.	10	8	3
150	Yellow Transparent.....	m	r ob	y	g	Aug.	Rus.	8	8	7

## SECTION I.—APPLES.—CONCLUDED.

Number.	Locality.					Remarks.
	East.	Center.	South.	Southern lake shore.	Northern lake shore.	
123	*?	*?	*?	*?	*?	A large, vigorous tree, moderately productive. Rarely planted. Profitableness doubtful.
124	*?	*?	*?	*?	*?	Tree moderately vigorous, productive. One of the finest dessert fruits of its season.
125	*?	*?	*?	*?	*?	Tree spreading, drooping, moderate regular bearer. Very desirable among sweet apples.
126	†	†	†	†	†	Promising for home use and market.
127	---	---	---	---	---	Can only be recommended as an amateur fruit. Tree lacks hardiness. Fruit often imperfect. Requires rich, warm, dry soil.
128	*	**	*	*	*	Tree a little tender and lacks productiveness. The most popular early sweet apple.
129	**	**	**	**	**	Best winter baking apple. The most popular and profitable sweet market apple.
130	---	*?	---	---	*?	Of little value, except where great hardiness is required.
131	---	---	---	---	---	Tree vigorous, upright, productive. A fine, long-keeping table fruit.
132	†	†	†	†	†	One of the best early Russian sorts.
133	**	**	*	*	**	Apt to blow down. A good early winter dessert fruit. Improves at the north.
134	†	†	†	†	†	A promising Russian variety.
135	*?	*?	*?	*?	*?	Tree vigorous, upright, spreading, productive. Little known; almost "very good."
136	*?	*?	*?	*?	*?	Tree moderately vigorous, productive, hardy. A fine, profitable, orchard fruit.
137	**	**	*	**	**	Fruit sometimes imperfect in Lenawee county. Very profitable for market.
138	*?	*?	*?	*?	*?	Distinct from N. Y. Vandevere. This variety is widely planted. Valuable.
139	**	**	*	*	**	Very early bearer; ruining the tree unless thinned and highly cultivated. Fine dessert apple. Sells well in market.
140	*	*	*	*	*	Tree vigorous. Bears early and abundantly. A valuable variety for general purposes.
141	**	**	*	*	**	Originated with Peter M. Gideon. Valuable at the north. Very hardy.
142	*	*	*	*	*	Popular old variety for home use. Somewhat lacking in productiveness, and hence unprofitable.
143	*?	*?	*?	*?	*?	Tree vigorous, upright, productive. Fruit of the Newtown Pippin class. Popular south.
144	*?	*?	*?	*?	*?	Tree a good grower; productive. Valued by some as a market variety.
145	*?	*?	*?	*?	*?	Hardy, vigorous, productive. Fruits vary greatly in size. Keep and sell well.
146	---	---	---	---	---	Hardy, prolific. A fine, though little known, winter fruit.
147	*?	*?	*?	*?	*?	Irregular grower; good, early bearer. Good for dessert, market or cider—Downing. Valuable in Lenawee county.
148	*?	*?	*?	*?	*?	Needs dry, warm soils. High, rich flavor. Uneven in size. Often unproductive. Not successful at the north. Fruit much in demand.
149	*?	*?	*?	*?	*?	Tree and fruit like the Green Newtown. Some doubt their distinctness.
150	*	*	*	*	*	One of the best of the early summer sorts for cooking purposes.

## SECTION II.—APPLES—CRABS.

## ABBREVIATIONS FOR THIS SECTION.

## Form.

a. angular.  
c. conical.  
f. flattened.  
l. lopsided or oblique.

o. oblong.  
ob. oblate or obtuse.  
ov. oval or ovate.  
r. roundish.

Number.	Names.	Description.						Use and value. Scale 1 to 10.		
		Size.	Form.	Color.	Quality.	Season.	Origin.	Dessert.	Cooking.	Market.
1	Hyslop.....	l	r ov	d r o	g	Sept. Nov.	Am.	4	8	10
2	Large Red.....	l	r ov	y r	g	Sept. Oct.	Am.	4	6	6
3	Large Yellow.....	l	r ov	y o	g	Sept. Oct.	Am.	5	8	8
4	Montreal.....	l	r ob	y r	g	Sept. Oct.	Am.	4	7	8
5	Transcendent.....	l	r ob	y cr	g	Sept.	Am.	5	8	10
6	Whitney.....	l	r ov	y r	b	Sept.	Ill.	7	8	9

## SECTION III.—APRICOTS.

## ABBREVIATIONS FOR THIS SECTION.

## Form.

c. conical.  
co. compressed.  
d. depressed.

o. oblong.  
ov. oval.  
r. roundish.

## Color.

o. orange.  
r. red.  
y. yellow.

Number.	Names.	Description.						Use and value. Scale 1 to 10.		
		Size.	Form.	Color.	Quality.	Season.	Origin.	Dessert.	Cooking.	Market.
1	Breda.....	m	r	o	v g	b. Aug.	Eur.	7	.....	.....
2	Early Golden.....	s	r ov	o	v g	m. July.	Am.	6	.....	.....
3	Large Early.....	m	o co	o	b	m. July.	Eur.	8	.....	.....
4	Moorpark.....	l	r	o y	b	b. Aug.	Eur.	9	.....	.....
5	Peach.....	v l	r d co	y o	b	b. Aug.	Eur.	10	.....	.....

## SECTION II.—APPLES—CRABS.

## ABBREVIATIONS FOR THIS SECTION.

## Color.

b. brown.  
c. carmine.  
cr. crimson.  
d. dark.

g. green.  
o. orange.  
p. purplish.  
r. red.

ru. russet.  
s. scarlet.  
v. vermillion.  
y. yellow.

Number.	Locality.					Remarks.
	East.	Center.	South.	Southern lake shore.	Northern lake shore.	
1	**	**	**	**	**	An exceedingly rich looking crab. Keeps well. Sells well. A vigorous tree, productive. Has the calyx large and prominent. One of the most beautiful and prolific. Bears in alternate years.
2	*	*	*	*	*	
3	*	*	*	*	*	
4	*	*	*	*	**	Unexcelled in beauty of appearance. Said to be less beautiful at the north. One of the largest, most productive and beautiful of the older crabs. Very large, beautiful and excellent. Tree vigorous, upright, productive.
5	**	**	**	**	**	
6	*	*	*	**	*	

## SECTION III.—APRICOTS.

Apricots are recommended for dessert or amateur purposes, with little reference to actual profit, as owing to occasional loss of the very early bloom, and liability to injury from extreme cold in unfavorable localities, together with extreme liability to the depredations of the curculio, little pecuniary return can be confidently anticipated from them. Since they are recommended only as amateur fruits, they are not quoted for cooking or market.

Number.	Locality.					Remarks.
	East.	Center.	South.	Southern lake shore.	Northern lake shore.	
1	*	*	*	*	*	Hardy, productive, excellent. Kernel sweet. Tree vigorous. Branches long, slender. Freestone. Vigorous. One of the best early varieties. Freestone. Kernel bitter.
2	†	†	†	†	†	
3	†	†	†	†	†	
4	*	*	*	*	*	One of the most popular. Stone perforated. Kernel bitter. Considered the finest variety. Stone perforated. Kernel bitter.
5	*	*	*	*	*	

## SECTION IV.—BLACKBERRIES.

ABBREVIATIONS FOR THIS SECTION.

Form.

c. conical.  
o. oblong.ov. oval.  
r. roundish.

Number.	Name.	Descriptions.						Use and value. Scale 1 to 10.		
		Size.	Form.	Color.	Quality.	Season.	Origin.	Dessert.	Cooking.	Market.
1	Agawam.....	l	r o	b	v g	m l	Am.	9	9	7
2	Ancient Briton.....	l	o ov	b	v g		Ark.	9	9	7
3	Early Harvest.....	s	r o	b	v g	v e	Ill.	8	8	8
4	Eldorado.....	l	r o	b	v g	e	Ohio			
5	Erie.....	l	r o	b	v g	m	Pa.	8	8	7
6	Kittatinny.....	l	r c	b	b	m	N. J.	10	10	7
7	Lucretia (Dewberry).....	l	o ob	b	v g	v e	Va.	8	8	7
8	Minnewaski.....	l	o ov	b	v g	m	N. Y.	8	8	7
9	Snyder.....	m	r ov	b	v g	e	Ind.	7	7	10
10	Stone.....	m s	r	b	v g	e	Wis.	7	7	7
11	Taylor.....	l	r o	b	v g	e	Am.	10	10	9
12	Wallace.....	l	o ov	b	v g	m	Am.	9	9	7
13	Western Triumph.....	m	ov	b	v g	m l	Am.	9	9	8
14	Wilson ( <i>Junior</i> ).....	l	o ov	b	g	e	N. J.	9	9	8

## SECTION V.—CHERRIES.—HEART AND BIGARREAU.

ABBREVIATIONS FOR THIS SECTION.

Form.

a. angular.  
co. compressed.c. conical.  
o. ovate or oval.l. long.  
h. heart shaped.ob. obtuse.  
r. roundish.

The numbers under the head of "cooking" recommend strictly for canning or drying with sugar as raisins.

Number.	Names.	Descriptions.							Use and value. Scale 1 to 10.		
		Size.	Form.	Color.	Quality.	Season.	Class.	Origin.	Dessert.	Cooking.	Market.
1	American Heart.....	l	h	a b r	g	m June	h	Am.	6	7	7
2	Bigarreau, <i>Yellow Spanish</i> .....	v l	ob h co	y c r	b	e June	b	Eur.	10	9	7
3	Black Eagle.....	m	ob h	b	b	b July	h	Eng.	9	8	9
4	Black Hawk.....	l	ob h co	p b	v g	e June	h b	Ohio.	9	8	9
5	Black Heart.....	l	h	b	v g	e June	h	Eur.	9	8	9
6	Black Tartarian.....	v l	ob h	p b	v g	m June	h b	Rus.	9	8	9
7	Cleveland.....	l	r b	r y	v g	m June	b	Ohio.	9	6	8
8	Downer.....	m	r h ov	a r	v g	b July	h	Mass.	9	6	10
9	Early Purple.....	m	r h	d r p	v g	b June	h	Eur.	9	6	6
10	Elton.....	l	l h	y b r	v g	m June	b	Eng.	9	7	9
11	Governor Wood.....	l	r h	y r	v g	m June	h	Ohio.	9	6	8
12	Kirtland Mary.....	l	r h	y r	v g	b July	b	Ohio.	8	---	7
13	Knight Early.....	l	ob h	d p b	v g	m June	h	Eng.	8	6	6
14	Mezel, <i>Bigarreau De Mezel</i> ..... <i>Great Bigarreau.</i>	v l	ob h	d r b	b	b July	b	Eur.	6	8	8
15	Napoleon.....	v l	l h	y r	g	b July	b	Eur.	6	6	8
16	Rockport.....	l	r ob h	r a	b	m June	b	Ohio.	9	7	9
17	Vilne Sweet.....	l	r h	r y	g	e June	h	Rus.	---	---	---
18	Windsor.....	l				b July	b	Ont.	---	---	---

## SECTION IV.—BLACKBERRIES.

## ABBREVIATIONS FOR THIS SECTION.

Color.

b. black.

w. white.

Number.	Locality.					Remarks.
	East.	Center.	South.	Southern lake shore.	Northern lake shore.	
1	*	*?	*?	*	---	Not fully hardy, but productive and fine.
2	*?	*?	*?	*?	---	Strong grower and prolific. Well worthy of extended trial.
3	*	*	*	*	*	Brunton has been disseminated under this name. The genuine is claimed to be hardy, but does best with protection.
4	†	†	†	†	†	Highly spoken of.
5	*?	*?	*?	*?	*?	A strong spreading grower. Productive in some localities.
6	*?	*?	*?	*?	*?	Too well known to need description. Sometimes rusts or mildews.
7	*?	*?	*?	*?	*?	The largest, most productive and best.
8	**	**	**	**	**	Vigorous, hardy, productive.
9	**	**	**	**	**	Not large, but good. Very hardy and prolific.
10	*?	*?	*?	*?	*?	Bears heavily. Size rather small. Hardy. In Lenawee county equals Snyder for market.
11	**	**	**	**	**	Claimed to be as hardy as Snyder.
12	*?	*?	*?	*?	---	Nearly hardy; vigorous; productive.
13	*	*	*	*	---	Hardy, vigorous and prolific. Valuable in Lenawee county.
14	*	*	*	*	*	One of the largest. Lacks richness. Needs winter protection.

## SECTION V.—CHERRIES.—HEART AND BIGARREAU.

## ABBREVIATIONS FOR THIS SECTION.

Color.

a. amber.  
b. black.  
br. bright.  
c. carmine.cr. crimson.  
d. dark.  
p. purplish.  
r. red.w. whitish.  
y. yellowish.

Class.

b. bigarreau.  
h. heart.

Number.	Locality.					Remarks.
	East.	Center.	South.	Southern lake shore.	Northern lake shore.	
1	*	*	*	*	---	Vigorous, spreading, productive; but variable in quality.
2	**	**	**	**	**	Downing says: "Largest, most beautiful, and delicious of cherries." Often cracks and rots in wet seasons.
3	*	*	*	*	*	Excellent. Requires age before it will bear profusely.
4	*	*	*	*	---	Fine tree. Fruit much like Bigarreau in its general qualities.
5	*	*	*	*	*	Very old. Tree large and hardy. The abundant fruit is of fine quality.
6	**	**	**	**	**	A rapid, erect grower. Prolific. Fruit very large and showy, but not of the highest quality. Tree lacks hardiness.
7	*	*	*	*	---	A seedling of the late Dr. Kirtland, of Cleveland, Ohio. Tree thrifty, spreading, productive.
8	*?	*?	*?	*?	---	One of the finest and most valuable late cherries. Of New England origin.
9	**	**	**	**	*	A moderate grower. One of the best of the very early cherries. Hardy for a Mazzard; but tender at the north.—[Parmelee.]
10	*	*?	*?	*	**	Originated in England in 1806. One of the best of its class and season.
11	**	**	**	**	**	Seedling of the late Dr. Kirtland. Every way desirable except for its liability to rot.
12	*	*	*	*	*	Seedling of the late Dr. Kirtland. Desirable for either dessert or market.
13	*?	*?	*?	*?	*?	A week earlier than Black Tartarian. Fine quality. Tree spreading.
14	*?	*?	*?	*?	*?	Supposed to be identical with Great Bigarreau and Large Red Prol.
15	**	*	*	**	*	Very large and showy. Very firm. Most valued for the market.
16	**	*	*	**	*	Seedling of the late Dr. Kirtland. Very highly esteemed. A good bearer.
17	†	†	†	†	†	A very promising sweet cherry.
18	†	†	†	†	†	Promising, but less hardy than is claimed.

## SECTION VI.—CHERRIES—DUKE AND MORELLO.

## ABBREVIATIONS FOR THIS SECTION.

## Form.

co. compressed.  
h. heart shaped.  
ob. oblate.  
ov. oval.  
r. roundish.

## Color.

a. amber.  
b. bright.  
d. dark.  
p. purplish.  
r. red.  
y. yellow.

Number.	Names.	Descriptions.							Use and value. Scale 1 to 10.		
		Size.	Form.	Color.	Quality.	Season.	Class.	Origin.	Dessert.	Cooking.	Market.
1	Brusseler Branne.....	l	r h	p r	v g	m July.	m	Rus.	7	9	10
2	Carnation.....	l	r	y w r	r	m July.	d	Fr.?	6	6	5
3	Choisy.....	m	r ob	y a r	b	m June.	d	Fr.	10	6	3
4	Early Richmond, <i>Kentish</i> .....	m	r ob	d r	v g	m June.	m	Eur.	5	9	10
5	Eugenie.....	l	r ob	d r	v g	m June.	d	Eur.	7	6	7
6	Late Duke.....	l	ob h	d r	v g	m July.	d	Eur.	7	7	6
7	Late Kentish, <i>Common Red</i> .....	m	r ob	d r	g	m July.	m	Eur.	4	8	8
8	Leib.....	m	r	r	g	July.	m	Eur.?	---	---	---
9	Louis Phillippe.....	l	r	d p r	v g	e July.	m	Fr.	4	10	10
10	Magnifique.....	l	ob	r	v g	e July.	d	Fr.	6	8	7
11	May Duke.....	l	r ob h	d r	b	m June.	d	Eur.	8	8	10
12	Montmorency ordinaire.....	l	r ob	d r	v g	e June.	m	Eur.	5	8	10
13	Montreuil.....	l	---	r	g	---	d	Eur.	---	---	---
14	Morello.....	l	ob h	d r	v g	m July.	m	Eur.	5	10	10
15	Reine Hortense.....	v l	r ov	d r	v g	m July.	d	Fr.	6	7	6
16	Royal Duke.....	l	r ob	d r	g	e June.	d	Eur.	6	7	7
17	Shadow Morello.....	l	r h	p r	v g	m July.	m	Rus.	7	9	10
18	Wragg.....	m	r ob	r	g	m July.	m	Iowa.	5	7	7

## SECTION VII. CURRANTS.

## ABBREVIATIONS FOR THIS SECTION.

## Form of bunch.

l. long.  
m. medium.  
s. short.

## Color.

b. black.  
br. bright.  
d. dark.  
r. red.  
w. white.

Number.	Names.	Descriptions.						Use and value. Scale 1 to 10.		
		Size.	Form of bunch.	Color.	Flavor.	Season.	Origin.	Dessert.	Cooking.	Market.
1	Cherry.....	l	s	r	v a	m July.	Eur.	7	8	8
2	Fay.....	l	l	r	a	July.	N. Y.	7	8	7
3	Lee.....	l	s	b	a m	m July.	Eur.	1	8	9
4	Naples.....	l	s	b	a m	m July.	Eur.	1	8	9
5	Prince Albert.....	m	m	d r	a	e July.	Eur.	8	8	8
6	Red Dutch.....	m	m	d r	a	b m July.	Eur.	9	10	8
7	Versaillaise.....	l	s	d r	a	m July.	Fr.	7	8	8
8	Victoria.....	m	l	br r	v a	e July.	Eng.	6	7	9
9	White Dutch.....	m	m	w	a	b m July.	Eur.	10	7	6
10	White Grape.....	m	m	w	a	b m July.	Eur.	9	8	8
11	White Star.....	m	s	r	a	m July.	Minn.	---	---	---

## SECTION VI.—CHERRIES—DUKE AND MORELLO.

## ABBREVIATIONS FOR THIS SECTION.

Class.

d. dnke.  
m. morello.

Number.	Locality.					Remarks.
	East.	Center.	South.	Southern lake shore.	Northern lake shore.	
1	†	†	†	†	†	Very hardy. Large fruit of fine quality. Productive.
2	*2	*2	*2	*2	*2	A beautiful, large, light-red cherry, highly esteemed where known.
3	*	*	*	*	*	One of the best dessert cherries of any class, but a thin bearer. When on sandy soil, or top-grafted on Morello proves productive.
4	**	**	**	**	**	One of the most profitable market cherries. Not as good as several of the Dukes.
5	*2	*2	*2	*2	*2	A new French cherry. An early and prolific bearer.
6	*	*	*	*	*	Valuable for dessert or cooking. Ripening after May Duke.
7	*	**	**	*	*	Emphatically the pie cherry of this country.
8	---	---	---	---	---	A newly introduced variety. Claimed to withstand the winters of the north-west. Unproductive.
9	*	*	*	*	*	A strong, healthy tree of the Morello class. Productive, valuable.
10	*	*	*	*	*	Moderate grower, productive. Good for dessert when fully ripe.
11	**	**	**	**	**	The type of its class. One of the oldest and most popular cherries.
12	*	*	*	*	*	Larger than Early Richmond and ten days later.
13	*	*	*	*	*	Well worth planting.
14	*	*	*	*	*	Highly esteemed for preserving and other culinary purposes.
15	*	*	*	*	*	A healthy and beautiful tree. A popular and desirable variety.
16	*	*	*	*	*	An upright, compact grower. Later than May Duke.
17	†	†	†	†	†	Fruit like Brusseier, but the tree is smaller.
18	†	†	†	†	†	Very hardy. Bears young.

## SECTION VII.—CURRANTS.

## ABBREVIATIONS FOR THIS SECTION.

Flavor.

a. acid.  
m. musky.  
v. very.

Number.	Locality.					Remarks.
	East.	Center.	South.	Southern lake shore.	Northern lake shore.	
1	*	*	*	*	*	Its size renders it popular. One of the most acid of currants.
2	*2	*2	*2	*2	*2	Long bunch. Large berry. Seldom productive.
3	*	*	*	*	*	Possibly a slight improvement upon Black Naples.
4	*	*	*	*	*	Good culinary fruit. Much sought in the market by foreigners.
5	*	**	*	*	**	Little injured by the worms. Good as a late sort.
6	**	**	**	**	**	Has no superior except in size. The best for all purposes.
7	*	*	*	*	*	By some believed to be superior to the Cherry currant. Others think them identical.
8	**	**	**	**	**	Valuable, rather late sort. It seems to be exempt from the attacks of the borer.
9	**	**	**	**	**	Better in quality, and in the habit of the plant than White Grape.
10	*	**	*	*	**	Plant of spreading, straggling growth. Larger, but not as good as White Dutch.
11	†	†	†	†	†	One of the most promising of the new sorts.

SECTION VIII.—GOOSEBERRIES.

ABBREVIATIONS FOR THIS SECTION.

Form of berry.

ov. oval.  
r. round.

Number.	Names.	Description.						Use and value. Scale 1 to 10.		
		Size.	Form of berry.	Color.	Quality.	Season.	Origin.	Desert.	Cooking.	Market.
1	Champion.....	m to l	r ov	w g	v g	Aug.				
2	Downing.....	m l	r ov	w g	v g	Aug.	N. Y.	8	10	10
3	Houghton.....	s	r	b	v g	Aug.	Mass.	6	9	8
4	Industry.....	l	r ov	r	v g	Aug.	Eur.	9	9	7
5	Mountain.....	m	r ov	r	g	m Aug.	N. Y.	5	7	5
6	Pale Red.....	s	r ov	r	g	Aug.	Am.	6	8	8
7	Pearl.....	m	r ov	y g	g	Aug.	Can.	9	10	9
8	Smith.....	l	ov	g	v g	Aug.	Ver.	10	10	9

## SECTION VIII.—GOOSEBERRIES.

## ABBREVIATIONS FOR THIS SECTION.

Color.

b. brown.  
g. green.r. red.  
w. whitish.

Number.	Locality.					Remarks.
	East.	Center.	South.	Southern lake shore.	Northern lake shore.	
1	†	†	†	†	†	Very productive. Worthy of trial.
2	**	**	**	**	**	Fine, stocky, vigorous plant; quite thorny. The highest quality of fruit.
3	*	*	*	*	*	Slender and straggling, but vigorous, prolific and excellent.
4	*?	*?	*?	*?	*?	Subject to mildew. Unproductive unless sprayed.
5	---	---	---	---	---	A strong plant. Berry with a very thick skin, and uneven size. Poor quality.
6	*	*	*	*	*	An old sort of slender but upright growth.
7	*	*	*	*	*	Although small, its productiveness makes it valuable.
8	*	*	*	*	*	Some doubt as to the vigor of the plant. An excellent variety.

## SECTION IX.—GRAPES.—NATIVE.

## ABBREVIATIONS FOR THIS SECTION.

## Bunch.

## Form.

## Berry.

b. broad.  
c. compact.  
l. long.

o. open or loose.  
s. short.

sh. shouldered.  
v. very.

r. round.  
o. oblong.  
ov. ovate or oval.

Number.	Names.	Descriptions.								Use and value. Scale 1 to 10.		
		Size.		Form.		Color.	Quality.	Season.	Origin.	Dessert.	Cooking.	Market.
		Bunch.	Berry.	Bunch.	Berry.							
1	Adirondac	l	l	c sh	r	p b	v g	b Sept.	N. Y.	8	---	4
2	Agawam, <i>Rog. 15</i>	l	l	c sh	r	d r	v g	m Sept.	h Mass.	7	---	7
3	Aminia, <i>Rog. 39</i>	l	l	---	r	b	v g	m Sept.	h Mass.	7	---	7
4	Barry	l	l	s b c	r	b	g	m Sept.	h Mass.	7	---	7
5	Brighton	m	l	c sh	r	r	v g	m Sept.	W. N. Y.	10	---	9
6	Catawba	m	l	sh o	r	r	v g	Oct.	Md.	9	---	6
7	Champion, <i>Talman</i>	m	l	s c sh	r	b	g	b Sept.	Am.	4	---	4
8	Clinton	m	s	c sh	r	b	g	Oct.	N. Y.	3	---	3
9	Concord	l	m l	c sh	r	b	v g	m Sept.	Mass.	7	---	10
10	Cottage	l	s	l	r	b	g	b Sept.	Mass.	6	---	5
11	Delaware	s	s	c sh	r	l r	b	m Sept.	N. J.?	10	---	9
12	Diamond	l	l	l sh	r	w	v g	m Sept.	N. Y.	9	---	6
13	Diana	l	l	c l	r	r l	v g	e Sept.	Mass.	6	---	6
14	Eaton	v l	v l	l sh	r	b	g	m Sept.	Mass.	4	---	8
15	Empire State	l	m	sh	r ov	w	v g	m Sept.	N. Y.	8	---	6
16	Eumelan	l	m	c sh	r	p b	v g	m Sept.	N. Y.	9	---	2
17	Goethe	m	l	ov	r	y g	v g	e Sept.	Mass.	8	---	3
18	Hartford	l	l	c sh	r	b	g	b Sept.	Conn.	4	---	6
19	Hayes	m	m	s b	r	y w	v g	Sept.	Mass.	8	---	6
20	Herbert, <i>Rog. 44</i>	l	l	l	r	b	v g	m Sept.	h Mass.	8	---	7
21	Iona	l	l	o ch	r o	r	b	m Sept.	N. Y.	10	---	6
22	Isabella	l	l	c sh	o	b	v g	e Sept.	S. Car.	6	---	3
23	Ives	m	m	c sh	r o	b	g	m Sept.	Ohio.	4	---	8
24	Janeville	s	m s	s c	r	b	g	m Sept.	Am.	4	---	5
25	Jessica	m s	m s	---	r	y g	b	b Sept.	Ont.	9	---	7
26	Jewell	s	s	s	r	b	v g	b Sept.	Kan.	8	---	7
27	Lady	m	l	l c	r	y g	b	m Sept.	Ohio.	10	---	7
28	Lady Washington	v l	m	sh c	r	y	g	e Sept.	N. Y.	7	---	3
29	Lindley, <i>Rog. 9</i>	m	m	l c	r	r	v g	m Sept.	h Mass.	7	---	8
30	Martha	m	l	sh o	r	y g	g	m Sept.	Mo.	4	---	6
31	Maseasoit, <i>Rog. 3</i>	m	l	s sh	r	r	g	m Sept.	h Mass.	7	---	7
32	Merrimac, <i>Rog. 19</i>	l	l	s b c	r	b	g	m Sept.	h Mass.	6	---	6
33	Michigan	m	m	---	m	---	v g	---	Mich.	6	---	8
34	Mills	---	---	---	---	b	v g	---	N. Y.	3	---	8
35	Moore Early	l	l	c sh	r	b	v g	b Sept.	Mass.	6	---	8
36	Moyer	s	s	c sh	r	w	v g	b Sept.	Ont.	8	---	7
37	Niagara	l	m	c sh	r	y w	v g	m Sept.	N. Y.	8	---	10
38	Pocklington	l	l	l sh	r	y	v g	e Sept.	N. Y.	7	---	8
39	Requa, <i>Rog. 28</i>	l	l	s o	r	r	g	m Sept.	h Mass.	7	---	7
40	Salern, <i>Rog. 53</i>	l	l	s b c	r	d r	g	e Sept.	h Mass.	7	---	8
41	Telegraph, <i>Christine</i>	l	l	c	r	b	g	m Sept.	Penn.	5	---	7
42	Ulster	l	l	sh	r	r	b	b Sept.	N. Y.	9	---	9
43	Vergennes	m	l	o s	r	r	v g	b Sept.	Ver.	7	---	7
44	Victor	s	s	c sh	r	b	v g	b Sept.	Kan.	8	---	7
45	Wilder, <i>Rog. 4</i>	l	l	c sh	r	b	v g	m Sept.	h Mass.	7	---	8
46	Winchell	m	m	sh	r	w	b	b m Sept.	Ver.	10	---	10
47	Woodruff	s b	l	sh	r	r	v g	m Sept.	Mich.	6	---	7
48	Worden	l	l	c sh	r	b	v g	m Sept.	N. Y.	8	---	10
49	Wyoming	s	m	c	m	b r	v g	m Sept.	N. Y.	4	---	6

## SECTION IX.—GRAPES.—NATIVE.

## ABBREVIATIONS FOR THIS SECTION.

## Color.

a. amber.  
b. black.  
d. dark.  
g. greenish.

l. light.  
li. lilac.  
p. purple.

r. reddish.  
w. whitish.  
y. yellowish.

Number.	Locality.					Remarks.
	East.	Center.	South.	Southern lake shore.	Northern lake shore.	
1	---	---	---	---	---	Subject to mildew of the foliage. Rarely successful.
2	*	*	*	*	*	Keeps well after gathering.
3	*	*	*	*	*	Very well esteemed by those who have fruited it. Excellent keeper.
4	*?	*	*?	*	*	One of Rogers' very numerous hybrids. Inclined to mildew.
5	**	**	**	*	*	One-fourth foreign. Highly satisfactory. Needs pollenizing.
6	*?	---	*?	*?	---	It is yet one of the best in localities where the season is long enough to ripen it. Good two years out of three at the south.
7	---	---	---	---	---	Very early, vigorous and productive, but its poor quality condemns it.
8	---	---	---	---	---	Is seldom good or even passable till ripened by frost. Fruit best on high, warm, gravelly soils.
9	**	**	**	**	**	Here, as elsewhere, this is "the grape for the million," since it can take care of itself.
10	*?	*?	*?	*?	---	Seedling from Concord by E. W. Bull. Far from satisfactory.
11	**	**	**	**	**	Slow grower. Fully as productive as Concord when well established. Fruit sometimes fails from dropping of the leaves.
12	*	*	*	*	---	Vigorous, healthy, promising as a variety for amateurs.
13	*?	*?	*	*	---	Rather foxy, with a thick, tough skin. One of the best keepers. A thin bearer on strong soils. Better on dry, warm soils.
14	*?	*?	*?	*?	---	Very large in both bunch and berry—market.
15	*	*	*	*	---	Promises well for both dessert and market.
16	*?	*?	*?	*?	---	A good dessert grape. May in some localities do for market. It seems to lack constitution.
17	---	---	*?	*?	---	Rather late for even southern Michigan.
18	---	*?	---	---	*?	Still prominent as one of the hardiest and most productive for early market; but very liable to drop its berries. Generally discarded.
19	*	*	*	*	*	Vigorous, hardy. Of fine quality. Valuable for amateurs.
20	---	*?	*?	*?	---	Another of the Massachusetts hybrids, of fair quality.
21	---	*?	*?	*?	---	Generally esteemed as the finest of our natives. The vine seems to lack constitution, and is not generally successful.
22	---	---	*?	*?	---	An old favorite. Still popular where it is sure to ripen. Is not generally successful.
23	---	*?	*?	*?	---	Valued for hardiness, vigor and productiveness. A good wine grape.
24	*?	*?	*?	*?	*	Hardy and vigorous. Ripens with Concord.
25	---	*?	*?	*?	---	Vine hardy, productive. Not satisfactory in some localities.
26	+	+	+	+	---	Promising early dessert grape.
27	*	*	*	*	*	Seedling of Concord, and as hardy and healthy; but not as vigorous and productive. Quality superior.
28	---	---	---	---	---	Valuable in locations where it will ripen. Ripens with Isabella.
29	*	*	*	*	*	A vigorous and productive vine. But little grown in this State. Worthy.
30	*?	*?	*?	*?	*?	Much sought for on account of its color. Very sweet, but too foxy.
31	*	*	*	*	*?	Moderately vigorous and productive; like most of the hybrids, liable to mildew.
32	*	*	*	*	*	Vigorous and prolific. Much like Wilder in quality and season.
33	+	+	+	+	+	Worthy of trial.
34	*?	*?	*?	*?	---	A good dessert grape. May prove profitable.
35	*	**	*	*	**	Vigorous grower. Excellent; especially for the north.
36	*?	*?	*?	*?	*?	Much like Delaware, but less sprightly in flavor.
37	**	**	**	**	*	A promising white, market grape. Very vigorous, healthy and productive.
38	*	*	*	*	---	Hardy, beautiful. Rather late.
39	*?	*?	*?	*?	---	Promising here, but requires further trial.
40	*	**	**	**	*	The largest, most attractive and popular of the Rogers hybrids. Vigorous, productive. Bunches often imperfect. Mildews.
41	*?	*?	*?	*?	*	Hardy and vigorous. Ripening with Hartford and similar in quality.
42	*	*	*	*	*	Hardy, productive. Promises superior excellence.
43	*	*	*	*	*?	Hardy. Ripens with Concord. Not of high quality.
44	*	*	*?	*?	*	A promising very early dessert variety.
45	*	*	*	*	*?	One of the finest and most popular of the Roger's hybrids. Will do for market.
46	**	**	**	**	**	The finest of the early white grapes. Green Mountain is identical with it.
47	*?	*?	*?	*?	*?	Hardy, vigorous. A market grape only.
48	**	**	**	**	**	A week earlier than Concord and better in quality. Very desirable.
49	---	---	---	---	---	Showy, but not desirable.

## SECTION X.—PEACHES.

## ABBREVIATIONS FOR THIS SECTION.

Form.		Color.		Flowers.		Glands.	
c. compressed.	ov. oval.	b. bright.	p. purple,	l. large.	g. globose.		
d. depressed.	r. round.	c. crimson.	r. red.	s. small.	o. obscure.		
o. oblong		d. dark.	w. white.		r. reniform.		
		g. green.	y. yellow.		s. serrate.		
		o. orange.					

Number.	Names.	Descriptions.									Use and value. Scale 1 to 10.		
		Size.	Form.	Color.	Quality.	Flowers.	Glands.	Adhesion.	Season.	Origin.	Desert.	Cooking.	Market.
1	Alberge .....	m	r	y p r	g	s	g	f	e Aug.	Fr.	6	---	8
2	Alexander .....	m	r	g w r	v g	l	g	c f	e July.	Ill.	9	---	9
3	Amsden .....	m	r	g w r	v g	l	g	c f	e July.	Mo.	9	---	9
4	Barnard .....	m l	r	y d r	g	s	r o	f	b Sept.	Am.	7	---	9
5	Beer Smock .....	l	ov	y r	g	s	r	f	m Oct.	Am.	6	9	9
6	Chili .....	m	ov c	y d r	g	l	r	f	e Sept.	N. Y.	6	8	9
7	Coolidge .....	l	r	w c	v g	s	g	f	m Aug.	Mass.	9	---	7
8	Corner .....	l				s	r		e Sept.	Mich.	---	---	---
9	Crawford, Early .....	l	o	y r	v g	s	g	f	e Aug.	N. J.	9	10	9
10	Crawford, Late .....	v l	r	y d r	v g	s	g	f	e Sept.	N. J.	8	10	9
11	Crosby .....	m	r	r y	g	s	r	f		Mass.	---	---	---
12	Druid Hill .....	l	r	g w r	b	s	g	f	e Sept.	Md.	10	---	7
13	Dumont .....	l	r	d y r	g	s	r	f	m Sept.	Mich.	8	7	8
14	Early Newington free ..	l	rc	y w r	b	s	g	f	e Aug.	Am.	10	---	7
15	Elberta .....	l	ro	r y	v g	s	r	f	b Sept.	Am.	8	---	9
16	Engle ( <i>Mammoth</i> ) .....	l	ro	y r	v g	s	g	f	m Sept.	Mich.	8	9	9
17	Foster .....	l	rd	d o r	v g	s	g	f	e Aug.	Mass.	8	8	9
18	George the Fourth .....	m	r	y w d r	b	s	g o	f	e Aug.	N. Y.	10	---	5
19	Gold Drop .....	m l	rov	b y	v g	l	r	f	e Sept.	Mich.?	7	9	10
20	Grosse Mignonne .....	l	rd	g y p r	b	l	g	f	e Aug.	Eur.	10	9	6
21	Hale .....	m	r	g w r	v g	l	g	f c	m Aug.	Ohio.	10	---	9
22	Heath Cling .....	l	o o v	y w r b	v g	s	r	c	b Oct.	Md.	9	9	7
23	Jacques .....	l	rc	d y r	v g	s	r	f	m Sept.	Mass.	7	9	9
24	Kalamazoo .....	l	ro	b y	v g	s	r	f	e Sept.	Mich.	8	9	10
25	Keyport .....	l	r	w c	g	s	r	f	b Oct.	Am.	6	7	8
26	Lady Palmerston .....	m l	r	y d r	g	s	r	f	e Sept.	Eng.	6	7	7
27	Large Early York .....	m l	r	w r	v g	s	g	f	b Sept.	Am.	8	8	8
28	Louise .....	m	rc	g w p r	v g	s	r	f	b Aug.	Eng.	8	---	8
29	Lemon Cling .....	l	o	y r	v g	s	r	c	e Sept.	Am.	6	7	8
30	Lewis .....	l	r	w r	g	s	r	f	e Aug.	Mich.	7	8	9
31	Moore .....	l	rov	w r	v g	s	g	f	b m Sept.	Mass.	8	6	8
32	Morris White .....	m	ov	g w p	v g	s	r	f	e Sept.	Am.	7	10	8
33	Mountain Rose .....	l	rc	w r	v g	s	g	f	b Sept.	N. J.	9	---	8
34	Oldmixon Cling .....	l	rov	y w r	b	s	g	c	m Sept.	Am.	8	9	7
35	Oldmixon Free .....	l	rov	y w r	v g	s	g	f	m Sept.	Am.	8	8	9
36	Red Cheek .....	l	rov	y b r	g	s	g	f	m Sept.	Am.	7	---	8
37	Richmond .....	m l	rc	y d r	v g	s	r	f	b Sept.	N. Y.	8	9	9
38	Rivers .....	l	r	y pink	b	l	r	f	m Aug.	Eng.	9	9	8
39	Saint John .....	l	rc	y r	v g	s	r	f	b Sept.	Am.	8	---	9
	<i>Crane's Early.</i>												
40	Salway .....	l	rd	y c r	v g	s	r	f	b Oct.	Eng.	8	9	8
41	Smock Free .....	l	ov c	o y d r	g	s	r	f	Oct.	N. J.	6	9	9
42	Snow Orange .....	m l	r	b y d r	v g	s	r	f	b Sept.	Mich.	6	7	9
43	Steadley .....	l	rov	w r	v g	s	r	f	b Oct.	Am.	9	9	---
44	Stump .....	v l	ro	w b r	v g	s	g	f	e Sept.	N. J.	8	8	8
45	Susquehanna .....	v l	r	y r	v g	s	r	f	m Sept.	Penn.	7	9	6
46	Troth .....	m	r	w b r	g	s	g	f	e Aug.	N. J.	5	---	7
47	Wager .....	m	o o v	y y	v g	l	g	f	b Sept.	N. Y.	8	9	8
48	Yellow Rareripe .....	l	ro	o y r	v g	s	g	f	b Sept.	Am.	8	8	8

## SECTION X.—PEACHES.

Since the peach is generally used in its fresh state, or for canning, which is only a mode of preserving it in a nearly fresh condition, we have generally omitted to give values in the column headed "cooking." Throughout Central Michigan, except in favorable localities, occasional severe winters prove fatal to the fruit buds of the peach, and sometimes even to the trees. These facts cannot be properly expressed in the starring, and hence are disregarded.

Number.	Locality.					Remarks.
	East.	Center.	South.	Southern lake shore.	Northern lake shore.	
1	*2	*2	*2	*2	*2	This is one of the earliest of yellow-fleshed peaches, and only desirable for that reason.
2	*	*	*	*	*	A partial cling, much like its supposed parent, Hale, and two or three weeks earlier. Profitable for market.
3	*	*	*	*	*	Almost exactly like Alexander in tree, fruit, and season of ripening.
4	*	**	*	**	*	When thoroughly thinned, the size is large; often overbears, becoming small.
5	†	†	*	**	†	Preferred to Smock by some growers.
6	*	*	*	**	*	Hardy; a good bearer and a profitable late variety on young trees. Lacks quality. Losing reputation.
7	*	*	*	*	*	One of the best pale-fleshed, early market peaches.
8	†	†	†	*	†	Grown and valued for market in Allegan county.
9	**	**	**	**	*	Very popular with both market men and fruitgrowers. Much used for canning. Others often sell under this name. Bloom tender, hence uncertain.
10	*	**	**	*	*	Lacks productiveness on light soils, and on young trees. Many place it first for profit.
11	†	†	†	†	†	A hardy and promising market sort.
12	*	*	*	*	*	An excellent late pale-fleshed peach that should be better known.
13	*	*	*	*	*	Tree and buds hardy. Shipping qualities best.
14	*2	*2	*2	*2	*2	Sometimes clings slightly. A fine amateur peach. Fruit large and beautiful. Very profitable at Lawton.
15	†	†	†	†	†	Well worthy of trial. Subject to leaf-curl.
16	†	†	†	*	*	Promising. Hardier than Crawford.
17	*	*	*	*	*	A good market peach, but almost identical in season with Early Crawford.
18	*2	*2	*2	*2	*2	One of the best for home use. Too tender and delicate for market.
19	**	**	**	**	*	Probably an unrecognized old variety. Largely grown for market.
20	*2	*2	*2	*2	*2	The true variety is one of the most delicious of peaches.
21	**	**	**	**	**	A fine peach and a vigorous tree. Sometimes rots before maturity. By many highly esteemed for market. A semi-cling.
22			*2	*2		One of the finest clings, but needs a long season in this latitude. Very profitable when it ripens fully.
23	*	**	**	**	*	Profitable, but not of high quality.
24	**	**	**	**	*	Highly praised by all who have fruited it.
25			*2	*2		Does not mature perfectly in unfavorable seasons. Surer on light soils.
26				*2		Originated by the late Thomas Rivers. Promising.
27	*	**	*	*	*	Has not become generally popular in Michigan.
28	*2	*2	*2	*2	*2	Ripens in advance of Hale or Beatrice. Very high quality. At Lawton said to sell well.
29	*2	*2	*2	*2		The largest and best of the yellow fleshed clings. Does not sell well.
30	**	**	**	**	**	An Allegan county seedling. A market peach.
31			*	*		A beautiful and promising peach. May be valuable for market if productive.
32	*	*	*	*	*	Valued for preserving and canning on account of its color.
33	*	*	**	**	*	A valuable market variety. Highly prized where fully proved.
34	*2	*2	*2	*2	*2	Where a cling is desired, this is one of the finest of its season.
35	*	*	**	**	*	A very old variety, which still holds a high position as a market peach.
36	*	*	*	*	*	An old sort. The parent of Crawford's Early and Late.
37	*	*	*	**	*	A new and valuable variety. A few days later than Early Crawford, and less acid.
38	*	*	*	*	*	An excellent very early sort; lacks color. Fruit large and beautiful. At Lawton very profitable.
39	*	**	**	**	*	Identical with Flaters St. John, Crane's Early and Yellow St. John.
40			*	*		Will only ripen at the south with certainty; fails in unfavorable seasons.
41	*	**	**	**		One of the latest profitable market peaches in Southern Michigan. Valuable.
42	*	*	*	*2	*2	Similar to Barnard; brighter in color, and slightly later. Must be thinned to insure good size.
43						Excellent for either dessert or canning.
44	*	*	*	*	*	A large and beautiful market peach of fair quality. Very profitable.
45	*2	*2	*2	*2	*	A large, beautiful and fine, rather late peach. Lacks productiveness.
46						An early and productive white fleshed peach of only medium quality.
47	*2	*2	*2	*2	*2	Said to be the most profitable variety in Mason county.
48	*	*	*	*	*	The genuine is a fine early peach. The one grown here is probably spurious.

## SECTION XI.—PEARS.

## ABBREVIATIONS FOR THIS SECTION.

## Form.

a. acute. e. elongated. ob. obtuse. ov. oval or ovate. r. roundish.  
 d. depressed. o. oblong. obo. obovate. p. pyriform. t. turbinate.

Number.	Names.	Descriptions.						Use and value. Scale 1 to 10.		
		Size.	Form.	Color.	Quality.	Season.	Origin.	Dessert.	Cooking.	Market.
1	Angouleme, <i>Duchess</i> .....	v l	o obo	g y ru	v g	Oct.	Fr.	7	9	10
2	Anjou.....	l	ob p	g ru c b	v g	Nov.	Fr.	9	9	10
3	Bartlett.....	l	o ob p	y ru r	v g	Sept.	Eng.	8	10	10
4	Bloodgood.....	m	t obo	y ru	v g	Aug.	N. Y.	9	8	4
5	Bosc.....	l	p	d y ru r	b	Oct.	Bel.	9	8	9
6	Bonsack.....	l	obo p	d y ru	v g	Sept. Oct.	Bel.	7	7	8
7	Brandywine.....	m	e ob p	y g ru r	v g	b Sept.	Penn.	7	7	5
8	Buffum.....	m	obo obo	d y r	v g	Sept.	R. I.	6	7	6
9	Clairgeau.....	l	p	y oc ru	g	Oct. Nov.	Fr.	6	7	9
10	Clapp Favorite.....	l	obo ob p	l c y	v g	Sept.	Mass.	8	8	9
11	Columbia.....	l	o obo	g y o	g	Nov. Jan.	N. Y.	7	8	6
12	Comice, <i>Doyenne du Comice</i> .....	l	r ob p	y c ru	b	Oct. Nov.	Fr.	9	7	7
13	Dana Hovey.....	s	obo ob p	g y ru	b	Nov. Jan.	Mass.	9	5	5
14	Dearborn.....	s	r p	l y	v g	Aug.	Mass.	7	5	3
15	Diel.....	l	obo ob p	y o ru b	v g	Sept. Dec.	Bel.	6	8	7
16	Easter Beurre.....	l	r obo ob	y g ru b	v g	Jan. Mar.	Eur.	6	8	3
17	Emile d'Heyet.....	l	o obo p	y o ru	b	Nov. Dec.	Bel.	10	8	8
18	Flemish Beauty.....	l	obo ob p	y ru r b	v g	Sept.	Bel.	7	7	8
19	Giffard.....	m	p	g y r	v g	e Aug.	Fr.	10	6	6
20	Glout Morceau.....	l	obo ob p	g y b	g	Dec.	Fr.	7	7	5
21	Gray Doyenne.....	m	o obo	l ru	b	Oct.	Eur.	9	8	8
22	Hardy.....	l	obo ob p	g ru b	v g	Sept. Oct.	Conn.	7	7	8
23	Howell.....	l	r p	l y ru	v g	Oct.	Idaho.	8	7	8
24	Idaho.....	l	r ob obo	g y ru	v g	Oct.	Bel.	8	8	8
25	Josephine of Malines.....	m	r ob p	g y ru	v g	Jan. Feb.	Am.	6	7	8
26	Kieffer.....	l	r ob p	y r	g	Nov.	Bel.	3	8	9
27	Lawrence.....	m	obo ob p	y ru	v g	Dec.	N. Y.	6	8	8
28	Louise Bonne (of Jersey).....	l	o p	g b r	v g	Sept. Oct.	Fr.	7	9	8
29	Lucrative.....	m	obo ob p	y g ru	b	Sept.	Fr.	10	8	8
	<i>Fondante d'Automne.</i>									
30	Madeleine.....	m	obo p	y g b	v g	July.	Fr.	8	8	7
31	Manning Elizabeth.....	s	obo ob p	l y r	v g	Aug. Sept.	Bel.	9	7	6
32	Mount Vernon.....	m l	r ob p	ru y b r	v g	Nov. Dec.	Mass.	8	8	6
33	Napoleon.....	l	ob p	y g	g	Sept.	Bel.	5	6	6
34	Onondaga.....	l	obo ob p	y ru	v g	Oct. Nov.	Conn.	7	8	9
35	Osband (Summer).....	s	r ov ob op	y r ru	v g	Aug.	N. Y.	7	7	8
36	Paradise (of Autumn).....	l	o obo a p	y ru	v g	Sept. Oct.	Bel.	8	6	4
37	Pound.....	l	p	y g b	v g	Dec. Mar.	Eur.?	1	8	7
38	Reeder.....	s m	r ob p	y ru	b	Nov.	N. Y.	9	8	5
39	Rostiezer.....	s	obo o p	y g r b	b	Aug.	Eur.	9	5	6
40	Seckel.....	s	obo	y b r ru	b	Oct.	Penn.	10	---	7
41	Sheldon.....	m	r ob obo	g y ru c	v g	Oct.	N. Y.	8	8	9
42	Souvenir du Congres.....	l	p r	y g	v g	Sept.	Fr.	8	8	9
43	Sterling.....	m	r ov p	y ru c	v g	Sept.	N. Y.	7	5	9
44	Stevens.....	l	r	y	v g	Sept.	N. Y.	9	6	6
45	Summer Doyenne.....	s	r obo p	y r	v g	July.	Bel.	9	5	8
	<i>Doyenne d'Ete.</i>									
46	Superfin.....	m	r p	y c ru	v g	Oct.	Fr.	7	8	8
47	Tyson.....	m s	a p	y ru c	b	Aug. Sept.	Penn.	9	6	7
48	Urbaniste.....	m l	obo p	y ru	v g	Oct. Nov.	Fl.	9	7	6
49	Vicar.....	l	l p	y b	g	Nov. Jan.	Fr.	4	8	6
50	White Doyenne.....	m l	obo	y r	b	Oct.	Fr.	10	7	7
51	Wilder ( <i>Early</i> ).....	s	obo	y b r ru	v g	Sept.	Am.	9	---	7
52	Winter Nelis.....	m	r obo	y g ru	b	Dec. Jan.	Fl.	9	7	---

## SECTION XI.—PEARS.

## ABBREVIATIONS FOR THIS SECTION.

Color.

b. brown.  
c. crimson.d. dark.  
g. green.l. light.  
o. orange.r. red.  
ru. russet.

y. yellow.

Number.	Locality.					Remarks.
	East.	Center.	South.	Southern lake shore.	Northern lake shore.	
1	**	**	**	**	*	When neglected proves unproductive. Profitable under good treatment, and on dwarf stocks. At north loses quality.
2	**	**	**	**	*	One of the best late autumn pears, whether for market or home use.
3	**	**	**	**	**	The leading market sort. Too musky to suit some tastes.
4	**	**	**	**	**	No garden should be without this. Fruit best when house ripened.
5	**	**	**	**	*	Fruit fair and even in size. Will bear to be planted for market.
6	**	*	*	**	*	Popular as a market pear. Also a good amateur fruit.
7	**	**	**	**	*	But little disseminated. A good early amateur pear.
8	*	*	*	*	*	Popular on account of the health, vigor, and productiveness of the tree. Market.
9	*	*	*	**	*	Soon becomes dry and insipid, after ripening. A showy market pear.
10	**	**	**	*	*	A strong grower. Fine large fruit. Inclined to rot at the core. A good market pear if gathered early.
11	**	**	**	**	---	Liable to drop or be blown from the tree prematurely.
12	**	**	**	**	---	New; gives promise of value.
13	**	**	**	**	*	One of the few winter pears of high quality.
14	**	**	**	**	*	Well known and esteemed, but too small to become very popular.
15	**	**	**	**	*	Fruit apt to be astringent on young trees. Should be house-ripened.
16	---	---	**	**	*	In a warm exposure and favorable season, this will be found satisfactory. Better south.
17	**	**	**	**	*	Little disseminated. A fruit of high quality.
18	*	**	*	*	*	Vigorous tree. Large, showy fruit, which decays soon at the center. Drops, and sometimes scabs or spots.
19	**	**	**	**	*	Fruit requires to be gathered before maturity—decays rapidly.
20	**	**	**	**	*	On old trees, when well ripened, this is an excellent pear.
21	**	**	**	**	*	Excellent for the amateur.
22	**	**	**	**	*	Not as well known as it should be.
23	**	**	**	**	*	Quite freely planted and generally esteemed.
24	†	†	†	†	†	Promising. Much like Sheldon.
25	*	*	*	*	*	Not as freely planted as it should be.
26	*	*	*	*	---	In this climate only valued for market and canning and that only at the south but when well grown it is a very profitable variety.
27	*	*	*	*	*	Tree healthy and vigorous. Should be grown on dry, warm soils.
28	*	*	**	*	*	A good market pear. Should always be grown as a dwarf.
29	*	*	*	*	*	An excellent and profitable old variety.
30	*	*	*	*	---	The earliest pear of good quality. Sometimes slightly astringent.
31	*	*	*	*	*	One of the most desirable amateur pears of its season.
32	*	*	*	*	*	A promising late autumn and early winter pear. Bears young.
33	*	*	*	*	*	An early and abundant bearer. Lacks quality.
34	*	**	*	**	*	A good, constant bearer of large, showy fruit of fair quality in most seasons.
35	*	*	*	*	*	Tree vigorous, productive. Fruit sufficiently good for the market.
36	---	---	---	---	---	Fruit somewhat like Beurre Bosc, but more variable.
37	**	**	**	**	---	Chiefly valued for the kitchen. Trees, strong, healthy.
38	**	**	**	**	*	A New York seedling from Winter Nelis.
39	**	**	**	**	*	Tree vigorous and productive. Fruit excellent, but unattractive in appearance.
40	*	**	*	**	**	The standard of high quality among pears. Tree forms a beautiful pyramid. Profitable when buyers come to know it.
41	*	*	*	*	*	A hardy, productive tree; and a good fruit for general purposes; not attractive in appearance.
42	*	*	*	*	*	Very large and beautiful. Variable in size. Not of high quality.
43	*	*	*	*	*	Both tree and fruit well adapted for the market.
44	**	**	**	**	*	An excellent and fine looking pear, but soon decays at the core.
45	**	**	**	**	**	The best and most satisfactory very early pear. Valued for early market.
46	*	*	*	*	*	A fine pear. Sometimes a little too acid. Productive.
47	*	*	*	*	*	A beautiful tree. Fruit grown to some extent for the market. A tardy bearer.
48	*	*	*	*	*	Too tardy a bearer. Is being abandoned; probably for this reason.
49	**	**	**	**	*	Tree very vigorous and productive; its greatest recommendation for this climate. It often fails to ripen well.
50	---	---	---	---	---	This old favorite is seldom successful in this State as it scabs and cracks.
51	†	†	†	†	†	Much like Seckel but earlier.
52	*	*	*	*	*	The fruit if well grown and ripened, is scarcely inferior to the Seckel. The tree must not be allowed to overbear.

## SECTION XII.—PLUMS.

In the grading and starrng of plums no reference is made to the prevalence of the curculio in the district; nor yet to the tendency of the tree to the premature rotting of the fruit or loss of foliage.

## ABBREVIATIONS FOR THIS SECTION.

## Form.

d. depressed.  
n. necked.

ob. oblate.  
ov. oval.

l. long.  
o. oblong.

obo. obovate.  
r. roundish.

Number.	Names.	Descriptions.							Use and value. Scale 1 to 10.		
		Size.	Form.	Color.	Quality.	Adhesion.	Season.	Origin.	Dessert.	Cooking.	Market.
1	Abundance .....	m	r ov	r	g	f c	Aug.	Jap.	8	8	9
2	Bavay .....	l	r d	g y	b	f c	Oct.	Bel.	8	8	8
3	Bleeker .....	m	r ov	y	v g	f c	e Aug.	N. Y.	8	8	8
4	Botan .....	m	r ov	y	g	f c	Aug.	Jap.	8	8	8
5	Bradshaw .....	l	ov obo n	r p	g	c f	e Aug.	Am.	7	10	10
6	Burbank .....	m	r	p	g		Aug.	Cal.			
7	Canada Egg [local name] .....	l			g	c	m Aug.	Ont.	7	7	8
8	Coe Golden Drop .....	l	ov n	y	v g	c	e Sept.	Eng.	8	8	9
9	Copper .....	m s	ov n	c b	g	c	e Sept.	Eur.	4	8	9
10	Damson .....	s	ov	b p	g	f c	Sept.	Am.	3	10	7
11	Duane Purple .....	v l	ov	r p	g	f c	m Aug.	N. Y.	7	4	8
12	Feilemberg, <i>Italian</i> .....	m	ov	b	g	f	b Oct.	Eur.	6	8	8
13	Field .....	l	r ov n	r p	g	c f	m Aug.	Am.	7	10	10
14	General Hand .....	v l	r ov	g	g	f	Sept.	Penn.?	6	7	7
15	German Prune .....	l	lov	b p	g	f c	Sept.	Eur.	6	9	9
16	Geiii .....	l	lov	r p	g	f c	Sept.	N. Y.	6	10	10
17	Grand Duke .....	l	r ov	p	v g	f c	Sept.	Eur.			
18	Green Gage .....	s	r	g y r	b	f	e Aug.	Eur.	10	8	5
19	Huling .....	v l	r ov	g y	g	c	e Aug.	Penn.	8	7	5
20	Imperial .....	l	ov	g y	b	f	b Sept.	N. Y.	9	9	8
21	Jefferson .....	l	ov	y p r	b	f	b Sept.	N. Y.	10	9	9
22	Lawrence Favorite .....	l	r ob	y g	b	f	m Aug.	N. Y.	10		
23	Lombard .....	m	r ov d	r p	g	c	b Sept.	N. Y.	6	10	9
24	McLaughlin .....	l	r ob d	y r	b	c	e Aug.	Me.	10	6	7
25	Miner .....	m	l r	p r	g	c	b Oct.	Penn.	6	6	4?
26	Orleans .....	m	r	r p	g	f	e Aug.	Eur.			
27	Peach .....	v l	r d	b r	g	f	b Aug.	Eur.	8	7	7
28	Pond, <i>Fonthill</i> .....	v l	ov n	y r	g	c	m Sept.	Eng.	6	7	10
29	Prince Englebert .....	l	ob ov	p br	v g	f	b Sept.	Bel.	8	8	10
30	Prince Yellow .....	m l	ov	y	v g	f	b Aug.	N. Y.	8	8	9
31	Quackenboss .....	l	r p	p	g	f c	Sept.	N. Y.	6	7	9
32	Red Magnum Bonum .....	l	ov	r	g	f	b Sept.	Eur.	5	7	7
33	Shropshire Damson .....	s	ov	d p	g	f c	e Sept.	Eng.	4	10	8
34	Smith Orleans .....	l	ov	r p	v g	c	e Aug.	N. Y.	8	8	8
35	Stanton .....	m	r ov	d p	g	f c	e Sept.	Eur.	8	8	9
36	Washington .....	v l	r ov	g y c	v g	f	e Aug.	N. Y.	8	10	7
37	Wild Goose .....	m	r ov	p	g	c	e July.	Tenn.?	6	5	---
38	Yellow Egg .....	v	ov	y	g	c	e Aug.	-----	6	8	7

## SECTION XII.—PLUMS.

ABBREVIATIONS FOR THIS SECTION.

Color.

b. blue.  
c. copper.

br. brownish.

y. yellow.

p. purple.

r. red.  
g. green.

Number.	Locality.					Remarks.
	East.	Center.	South.	Southern lake shore.	Northern lake shore	
1	*	*	*	**	*	Very productive. The hardest of its class.
2	*	*	*	*	*	Nearly or quite as fine as Green Gage. Tree a better grower.
3	*	*	*	*	*	Hardy. A good regular bearer. Shoots downy.
4	**	**	**	**	*	Similar to Abundance except in color.
5	*	*	*	*	*	Grows and bears well. A superior market variety.
6	†	†	†	†	†	A promising Japanese variety.
7	*	*	*	*	*	Probably an unrecognized old variety. Very hardy and productive in Mason county.
8	**	**	**	**	**	Beautiful. Excellent. Perhaps may not ripen with certainty at the extreme north.
9	**	**	**	**	**	Valued for market and cooking.
10	*	*	*	*	*	A slow grower. Productive. Valued for preserves. Nearly free from rot.
11	*	*	*	*	*	Too soft and uneven in size for market.
12	*	*	*	*	*	Tree vigorous, spreading, branches smooth.
13	†	†	†	†	†	Promising, as it ripens ten days earlier than Bradshaw.
14	*	*	*	*	*	Does not succeed well in Mason county.
15	*	*	*	*	*	Valued for drying and preserving.
16	**	**	**	**	**	One of the most valuable of the new plums.
17	†	†	†	†	†	New. Worthy of trial.
18	*	*	*	*	*	The standard of quality among plums. Tree a slow grower.
19	**	**	**	**	**	Tree very vigorous, upright, moderate bearer.
20	*	*	*	*	*	Productive, excellent; shoots dark, downy, vigorous.
21	**	**	**	**	**	A slow grower, good bearer. Profitable at the north.
22	**	**	**	**	**	A seedling from Green Gage. Productive.
23	**	*	*	*	*	Tree vigorous, hardy and productive. The leading market variety. Tree not satisfactory at St. Joseph. Too much grown to be profitable.
24	*	*	*	*	*	Nearly or quite equal to Green Gage. Hardy, vigorous, productive.
25	**	**	**	**	**	Comparatively unproductive if standing alone. Very hardy. One of the best of the Americana species.
26	**	---	**	**	**	Vigorous. Branches gray and very downy.
27	---	---	---	**	**	Tree upright, vigorous. A moderate bearer.
28	**	**	**	**	**	Productive, vigorous. Branches smooth, grayish. Dorr's Favorite of Oceana county is identical with this.
29	*	**	*	*	*	Tree a great bearer. Valuable for market.
30	**	**	**	**	**	An old favorite. Hardy, productive.
31	*	*	*	*	*	A rapid, upright grower; productive.
32	*	*	*	*	*	The genuine has slender, smooth shoots.
33	*	**	*	**	*	Better than Dameron for market.
34	*	*	*	*	*	One of the most vigorous; shoots glossy, reddish purple; very productive.
35	†	†	†	†	†	Worthy of trial as a late sort.
36	*	*	*	*	*	One of the largest and most beautiful, but inclined to rot on the tree. Free from rot at the north.
37	**	**	**	**	**	An uncertain bearer at the north; probably from imperfect pollenization. A variety of the <i>chicasa</i> species.
38	*	*	*	*	*	A fine market variety, but rots in some seasons at the south, and as far north as Mason county.

## SECTION XIII.—QUINCES.

ABBREVIATIONS FOR THIS SECTION.

Form.

ob. obtuse.

p. pyriform.

r. round.

Number.	Names.	Description.						Use and value. Scale 1 to 10.		
		Size.	Form.	Color.	Quality.	Season.	Origin.	Dessert.	Cooking.	Market.
1	Champion.....	v l	ob p	g	v g	Nov.	Am.	----	8	8
2	Meech.....	l	r ob p	g	v g	Oct. Nov.	N. J.	----	10	10
3	Orange, <i>Apple</i> .....	l	r p	g	v g	Oct. Nov.	Eur.	----	10	10
4	Rea.....	l	r ob p	g	g	Oct.	N. Y.	----	10	10

SECTION XIV.—RASPBERRIES.—RUBUS OCCIDENTALIS AND SUPPOSED HYBRIDS  
ROOTING FROM THE TIPS OF THE BRANCHES.

ABBREVIATIONS FOR THIS SECTION.

Form.

c. conical.

ob. obtuse.

r. roundish.

Number.	Names.	Description.						Use and value. Scale 1 to 10.		
		Size.	Form.	Color.	Quality.	Season.	Origin.	Dessert.	Cooking.	Market.
1	Carman.....	m	r	b	v g	m July.	Conn.	7	7	6
2	Caroline.....	m	r	o y	v g	m July.	N. Y.	9	9	6
3	Conrath.....	m l	r	b	v g	b July.	Mich.	9	9	9
4	Cromwell.....	m	r	b	v g	b July.	Conn.	8	7	5
5	Doolittle, <i>American Black</i> .....	s	r	b	g	m July.	N. Y.	5	7	7
6	Earhart.....	m	r	b	v g	July, Oct.	Conn.	9	7	4
7	Gregg.....	v l	r	b	v g	m July.	Ind.	7	9	10
8	Hilborn.....	v l	r	b	v g	m July.	Out.	9	9	10
9	Hopkins.....	m l	r	b	g	m July.	Kan.	6	6	8
10	Johnston Sweet.....	m	r	b	g	b July.	N. Y.	4	4	7
11	Kansas.....	m l	r	b	v g	b July.	Kan.	8	9	9
12	Mammoth Cluster, <i>McCormick</i> .....	m l	ob c	b	v g	July, Aug.	Am.	6	9	9
13	Muskingum ( <i>Hybrid?</i> ).....	l	r	p r	v g	m July.	Ohio.	8	9	8
14	Nemaha.....	l	r ob	b	g	m July.	Neb.	5	5	9
15	Ohio.....	l	r	b	g	m e July.	Ohio.	8	9	9
16	Older.....	m l	r	b	v g	m July.	Iowa.	8	9	9
17	Palmer.....	m	r	b	v g	b July.	Ohio.	8	9	9
18	Shaffer ( <i>Hybrid?</i> ).....	l	r	p r	v g	m e July.	N. Y.	8	10	8
19	Sonhegan, <i>Tyler</i> .....	m	r	b	g	b m July.	N. H.	8	9	8

## SECTION XIII.—QUINCES.

ABBREVIATIONS FOR THIS SECTION.

Color.

y. yellow.

Number.	Locality.					Remarks.
	East.	Center.	South.	Southern lake shore.	Northern lake shore.	
1	*	*	*	*	*	An early and prolific bearer. Very downy. Very late. Said to be very productive and of superior quality. Well known and universally approved. Larger than the orange and equally good. Tree thrifty.
2	*	*	*	*	*	
3	*	*	*	*	*	
4	*	*	*	*	*	

SECTION XIV.—RASPBERRIES.—*RUBUS OCCIDENTALIS* AND SUPPOSED HYBRIDS;  
ROOTING FROM THE TIPS OF THE BRANCHES.

ABBREVIATIONS FOR THIS SECTION.

Color.

b. black.

p. purple.

r. red.

y. yellow.

Number.	Locality.					Remarks.
	East.	Center.	South.	Southern lake shore.	Northern lake shore.	
1	*	*	*	*	*	Of medium quality only. Supposed hybrid between <i>Idæus</i> and <i>Occidentalis</i> . A family berry. One of the most promising of the new early sorts. A new and promising early variety.
2	*	*	*	*	*	
3	*	*	*	*	*	
4	*	*	*	*	*	
5	*	*	*	*	*	Desirable when great hardiness is required. A little later than Souhegan. Fruits on new canes till killed by frosts. Larger than McCormick. Is now the leading Black Cap. Nearly as large as Gregg; better in flavor, and clear black in color.
6	*	*	*	*	*	
7	*	*	*	*	*	
8	*	*	*	*	*	
9	*	*	*	*	*	A very popular sort. Very seedy. For this reason profitable for drying. One of the largest medium early black caps. Plant very vigorous with stout thorns. Very productive. Formerly very popular.
10	*	*	*	*	*	
11	*	*	*	*	*	
12	*	*	*	*	*	
13	*	*	*	*	*	Apparently an improvement upon Shaffer. Fruit firmer. Much like Gregg, and claimed to be hardier. A profitable market variety; good for drying. Very hardy. A promising new variety.
14	*	*	*	*	*	
15	*	*	*	*	*	
16	*	*	*	*	*	
17	*	*	*	*	*	The best early Black Cap. Enormous grower and bearer. Fruits ripen in succession. Superior for canning. A good, early, market Black Cap.
18	*	*	*	*	*	
19	*	*	*	*	*	

SECTION XV.—RASPBERRIES.—*RUBUS IDÆUS* AND *STRIGOSUS*, INCREASING BY SUCKERS OR SPROUTS.

ABBREVIATIONS FOR THIS SECTION.

Form.

c. conical.

ob. obtuse.

r. roundish.

Number.	Names.	Descriptions.						Use and value. Scale 1 to 10.		
		Size.	Form.	Color.	Quality.	Season.	Origin.	Dessert.	Cooking.	Market.
1	Brandywine .....	m	r ob c	b r	v g	July.	Am.	8	9	9
2	Clarke .....		c	b c	v g	e July.	Conn.	8	8	7
3	Crimson Beauty .....	m	r c	b c	v g	b July.	Kas.	8	7	8
4	Cuthbert .....	l	r c	b c	b	m July.	N. Y.	8	8	10
5	Golden Queen .....	l	r c	o	b	m July.	N. J.	8	8	9
6	Hansell .....	s	r	r	g	b July.	N. J.	7	7	7
7	Herstine .....	l	r ob c	b s	v g	July.	Penn.	10	10	8
8	Mariboro .....	l	r	r	g	b July.	N. Y.	7	7	9
9	Orange .....	l	c	o	b	July.	Penn.	10	10	4
10	Philadelphia .....	m	r	p r	g	July.	Penn.	6	8	8
11	Reder .....	l	r	b r	v g	m July.	Mich.	9	9	6
12	Reliance .....	m	r	b r	g	e July.	N. Y.	9	9	8
13	Turner .....	m	r	b r	v g	July.	Ill.	9	8	9

## SECTION XVI.—STRAWBERRIES.

ABBREVIATIONS FOR THIS SECTION.

Form.

c. conical.  
co. coxcombed.  
l. long.  
n. necked.

o. oblong.  
ob. obtuse.  
ov. oval or ovate.  
r. roundish.

Color.

b. bright.  
c. crimson.  
d. dark.

p. pale.  
r. red.  
s. scarlet

Number.	Names.	Descriptions.								Use and value. Scale 1 to 10.		
		Size.	Form.	Color.	Quality.	Sex.	Texture.	Season.	Origin.	Dessert.	Cooking.	Market.
1	Alpha .....	m	ov c	r	s	b	m	9 June.	Ont.	8	9	8
2	Beder Wood .....	l	r c	c	g	b	m	15 "	Ill.	7	---	10
3	Belmont .....	v l	l r c	b c	b	b	f	20 "	Mass.	10	---	5
4	Bidwell .....	v l	l c n	b s	v g	b	f	12 "	Mich.	8	8	10
5	Bubach No. 5 .....	v l	ob r c	b c	v g	p	m	20 "	Ill.	8	---	6
6	Captain Jack .....	n.	r c	b c	v g	b	f	10 "	Mo.	8	---	7
7	Charles Downing .....	l	r c	d s	v g	b	m	10 "	Ken.	8	---	5
8	Crescent .....	l	c	d s	g	b ob s	s	12 "	Conn.	7	4	5
9	Cumberland .....	v l	r ob c	b c	v g	b	m	12 "	Penn.	9	8	8
10	Enhance .....	m l	c co c	d r	g	b	f	12 "	Ohio.	7	---	8
11	Epping .....	m l	r d c	b s	g	p	f	16 "	N. H.	8	---	8
12	Eureka .....	v l	o c	b c	v g	p	m	17 "	Ohio.	8	---	8

SECTION XV.—RASPBERRIES.—*RUBUS IDÆUS* AND *STRIGOSUS*, INCREASING BY SUCKERS OR SPROUTS.

## ABBREVIATIONS FOR THIS SECTION.

## Color.

b. bright. c. crimson. o. orange. p. purplish. r. red. s. scarlet.

Number.	Locality.					Remarks.
	East.	Center.	South.	Southern lake shore.	Northern lake shore.	
1	*?	*?	*?	*?	*?	Its beauty, size, color and firmness are strongly in its favor.
2	---	---	---	---	---	An early red. Does not set well. Not fully hardy away from lake protection.
3	**	*?	*?	*?	*?	Unproductive on southern lake shore.
4	**	**	**	**	**	Not self-fertile. Must be planted with other varieties.
5	*	*	*	*	*	Very firm, productive and hardy. Has come to be the leading market variety of its class.
6	*	*	*	*	*	Like Cuthbert, except in the color of the fruit.
7	*?	*?	*?	*?	*?	Hardy. Lacks vigor and productiveness.
8	*	*	*	*	*	May not be fully hardy in the interior of the State. Lacks firmness. Valuable where it will stand; especially for home use.
9	*	*	*	*	*	Fairly vigorous and productive. Is being extensively planted.
10	*?	*?	*?	*?	*?	Must have winter protection. Unequaled for amateur purposes; but very tender.
11	---	---	---	---	---	Entirely hardy; dull color; lacks quality and size. Suckers but little. A bad shipper. Nearly abandoned.
12	*?	*?	*?	*?	*?	Highly esteemed where fully tested. Canes not always healthy.
13	*?	*?	*?	*?	*?	Berries good, even size. Profitable, but its color is too dark.
13	*?	*?	*?	*?	*?	Very hardy; productive. Suckers profusely. Lacks firmness. Old but still valuable.

## SECTION XVI.—STRAWBERRIES.

## ABBREVIATIONS FOR THIS SECTION.

## Sex of blossoms.

b. bi-sexual or perfect.  
p. pistillate.

## Texture.

f. firm.  
m. medium.  
s. soft.

## Season.

The date (in June) of the ripening of the first perfect specimen is given in each case as the most convenient mode of indicating the relative season.

Number.	Locality.					Remarks.
	East.	Center.	South.	Southern lake shore.	Northern lake shore.	
1	*?	*?	*?	*?	*?	Hybrid of the late Chas. Arnold. A fairly productive early sort for home use.
2	*	*	**	**	*	Plant healthy and vigorous—Market.
3	*?	*?	*?	*?	*?	Superior dessert fruit. May prove profitable for market.
4	**	**	**	**	**	Does not always ripen well at the tip. Valuable no longer.
5	**	**	**	**	**	One of the best new varieties for market.
6	*?	*?	*?	*?	*?	Productive. Even sized, but not large enough or good enough.
7	*?	*?	*?	*?	*?	Rusts badly. Its place is now occupied.
8	*	*	*	*	*	Vigorous plant. Very prolific, but lacks quality and firmness. Foliage healthy.
9	*	*	*	*	*	Excellent as a berry for home use, or for near marketing.
10	**	**	**	**	**	One of the largest and most productive.
11	+	+	+	+	+	Promising for market.
12	*?	*?	*?	*?	*?	Bears profusely. Will not remain long on the list.

# STATE HORTICULTURAL SOCIETY.

## SECTION XVI.—STRAWBERRIES.—CONTINUED.

Number.	Names.	Descriptions.							Use and value. Scale 1 to 10.			
		Size.	Form.	Color.	Quality.	Sex.	Texture.	Season.	Origin.	Dessert.	Cooking.	Market.
13	Gandy.....	v l	ob c	b c	v g	b	m	19 June.	N. J.	9	---	9
14	Gem (Nehring).....	v l	c	b r	g	p	f	17 "	Ill.	6	---	9
15	Greenville.....	l	r c	b c	g	p	m	17 "	Ohio.	8	---	9
16	Haverland.....	l	o c	b c	v g	p	f	11 "	Ohio.	9	---	9
17	Jersey Queen.....	m	ob c	c	g	p	m	15 "	N. J.	7	---	7
18	Jessie.....	v l	ob c	b c	v g	b	f	17 "	Wis.	9	---	7
19	Kentucky.....	l	l r c	b s	v g	b	f	16 "	Ky.	8	---	7
20	Manchester.....	l	c r	c	g	p	f	26 "	N. J.	8	8	8
21	Marshall.....								Mass.			
22	Miner.....	l	r c	c	g	b	s	14 "	N. J.	8	7	7
23	Mt. Vernon.....	l	c r	b s	g	b	m	24 "		7	8	8
24	Mrs. Cleveland.....	l		b c		p		15 "	Ohio.	6		9
25	Parker Earle.....	m l	l c	c	v g	b	f	15 "	Texas.	8	---	10
26	Parry.....	v l	r ob c	s	b	b	f	26 "	N. J.	10	---	
27	Pearl.....	m	o c	c	b	b	m	16 "	N. J.	9	---	
28	Saunders.....	l	c	c	v g	b	f	12 "	Ont.	7	---	9
29	Sharpless, Ontario.....	v l	o c co	b r	v g	b	m	14 "	Penn.	8	---	8
30	Shuchless.....											
31	Timbrell.....											
32	Triomphe (de Gand).....	l	r ob c	b r	b	b	f	12 "	Bel.	10	---	5
33	Vick.....	m	r c	c	v g	b	f	17 "	Mo.	8	---	7
34	Warfield No. 2.....	m	c	d r	v g	p	f	12 "	Ill.	9	---	10
35	Wilson.....	l	r c	d c	g	b	f	11 "	N. Y.	6	9	9

## SUMMARY OF REJECTED VARIETIES.

### LIST OF APPLES.

(The dates, 1893, etc., show the year the variety was dropped.)

Names.	Year.	Names.	Year.
American Beauty.....	1893	Drap d'or.....	1893
American Pippin.....	1893	Early Long Stem.....	1888
Anglo American.....	1893	Evening Party.....	1890
Aunt Hannah.....	1890	Flower (of Genesee).....	1893
Autumn Pearmain.....	1879	Fort Miami.....	1888
Autumn Sweet Swaar.....	1893	Foundling.....	1898
Bars.....	1890	Fourth of July.....	1893
Beauty of Kent.....	1893	Gabriel (Ladies' Blush).....	1888
Belle et Bonne.....	1893	Garden [Comstock's].....	1893
Bentley Sweet.....	1893	Green's Choice.....	1888
		Hall.....	1883
Better Than Good.....	1883	Harvest Red Streak.....	1890
Bottle Greening.....	1893	Herefordshire.....	1893
Hurr Sweet.....	1893	Hog Island Sweet.....	1893
Bush.....	1879	Holland Pippin.....	1893
Chronical.....	1890	Hollow Crown.....	1893
Craig's August.....	1888	Horse.....	1893
Cumberland Spice.....	1893	Housum's Red.....	1888
Daniel.....	1890	Hunt Russet.....	1893
Detroit Black.....	1893	Hulbart.....	1893
Detroit Red.....	1893	Indiana Favorite.....	1898

## SECTION XVI.—STRAWBERRIES.—CONTINUED.

Number.	Locality.					Remarks.
	East.	Center.	South.	Southern lake shore.	Northern lake shore.	
13	*	*	*	*	*	Desirable late market berry. Good dessert fruit.
14	*?	*?	*?	*?	*?	Plant exceedingly vigorous and productive. Fruit very large and showy.
15	†	†	†	†	†	Very promising for local market.
16	*	**	**	**	**	Plant vigorous. Proves valuable in many places. Stem weak. Fruit soft.
17	*?	*?	*?	*?	*?	Variable. Sometimes productive, but is little grown.
18	*?	*?	*?	*?	*?	Highly praised when produced, but not generally productive.
19	*?	*	*	*	*	Vigorous. A good late market berry. Nearly superseded.
20	*?	*	*	*	*	Has been a leading market berry.
21	†	†	†	†	†	A highly praised new sort.
22	*?	*?	*?	*?	*?	Vigorous and productive in some sections.
23	*?	*?	*?	*?	*?	Very highly praised as a market variety by some growers. Quite late.
24	*	*	*	*	*	An Ohio seedling of fine promise.
25	**	**	**	**	**	Of good size and quality. Hardy. Very productive. Valuable if given high cultivation.
26	*?	*?	*?	*?	*?	Very beautiful, fine flavor. Large. Productive in some places. Plant generally weak.
27	*?	*?	*?	*?	*?	A promising fruit, of high quality. Subject to rust.
28	*	*	*	*	*	A promising market variety, originated by John Little of Ontario.
29	*	*	*	*	*	Is attracting much attention. Lacks firmness for distant marketing. Does best in hills.
30	†	†	†	†	†	Introduced with high encomiums.
31	†	†	†	†	†	Not yet tested. Promises well.
32	*	*	*	*	*	Flavor rich, excellent. Must be grown in hills to warrant success for market.
33	*?	*?	*?	*?	*?	In plant and fruit much like Captain Jack.
34	**	**	**	**	**	A vigorous plant. Very productive. Best for market.
35	*	*	*	*	*	Colors early. Only good when fully ripe. Later pickings fail in size. Formerly the leading market berry with the mass of growers.

## SUMMARY OF REJECTED VARIETIES.—CONTINUED.

## APPLES.—Continued.

Names.		Year.	Names.		Year.
Jefferson County .....		1893	Progress .....		1888
Jewett Best .....		1893	Pumpkin Russet .....		1888
ewett Red .....		1893	Quarrenden .....		1893
Kaighn .....		1893	Rebecca .....		1893
Klaproth .....		1893	Richardson .....		1893
Lacker .....		1888	River .....		1888
Lancaster Greening .....		1879	Rose Red (Autumn Red) .....		1893
Ledge Sweet .....		1893	Scarlet Pearmain .....		1893
London .....		1893	Sine Qua Non .....		1893
Macomber .....		1893	Slingerland .....		1893
Marston .....		1893	Somerseset (N. Y.) .....		1888
May (Seek-no-further) .....		1893	Spiced Sweet .....		1890
McAfee .....		1893	Stillman .....		1893
Melt-in-the-mouth .....		1888	Striped Bellflower .....		1893
Newark Pippin .....		1888	Summer Pippin .....		1893
Nick-a-jack .....		1893	Summer Rambo (Mich.) .....		1893
Northern Sweet .....		1888	Summer Bellflower (N. Y.) .....		1888
Orange Pippin .....		1893	Summer Greening .....		1888
Ortley (White Detroit) .....		1893	Sweet Baldwin .....		1888
Pittsburgh .....		1893	Sweet and Sour .....		1890
Pound Royal (Winter) .....		1893	Sweet Rambo .....		1893

## SUMMARY OF REJECTED VARIETIES.—CONTINUED.

Names.	Year.	Names.	Year.
<i>APPLES.—Continued.</i>			
Sweet Vandevere .....	1893	Red Heart.....	1888
Sweet Winesap .....	1893	Red Jacket.....	1893
Table (Greening) .....	1888	Rivers Amber.....	1883
Toole Indian.....	1893	Rumsey's Late Morello.....	1885
Twin.....	1888	Sparhawk.....	1893
Walpole.....	1893	Tradescant.....	1888
Washington Royal .....	1893	Transparent Guigne.....	1888
Water.....	1893	Tecumseh.....	1893
Wealthys Favorite.....	1888	White French.....	1888
Western Spy.....	1890	White Tartarian.....	1888
Wetherell Sweet.....	1893	Wilkinson.....	1888
White Doctor.....	1893		
		<i>CURRENTS.</i>	
White Janeating.....	1890	Anger's (Fertile de Anger).....	1893
White Spanish Reinette.....	1893	Hative.....	1893
Winter Pippin (Mich.).....	1893		
Winter Paradise.....	1893		
Winthrop Greening.....	1893		
		<i>GRAPES.</i>	
<i>APPLES—CRABS.</i>		Allen.....	1888
Briers Sweet.....	1888	Alvey.....	1888
Byers.....	1893	Anna.....	1888
Red Siberian.....	1893	Belvidere.....	1888
Soulard.....	1893	Black Hawk.....	1888
<i>APRICOTS.</i>		Canada (Arnold's 16).....	1893
Hemskirk.....	1893	Cornucopia (Arnold's 2).....	1888
Red Masculine.....	1893	Creveling.....	1893
St. Ambroise.....	1893	Croton.....	1888
Turkey.....	1893	Elvira.....	1893
<i>BLACKBERRIES.</i>		Essex (Rogers' 41).....	1893
Barnard.....	1893	Gaertner.....	1893
Branton.....	1890	Israella.....	1893
Dorchester.....	1893	Kalamazoo.....	1893
Wachusett.....	1893	Mottled.....	1888
White Seedling.....	1881		
		Neff (Kenka).....	1888
<i>DEWBERRIES.</i>		Norton's Virginia.....	1888
Bartle.....	1893	Othello (Arnold's 1st).....	1883
Mammoth.....	1893	Perkins.....	1893
<i>CHERRIES.</i>		Peter Wylie.....	1888
Arch Duke.....	1893	Rebecca.....	1888
Buttner's Yellow.....	1888	Roger's 20.....	1888
Bauman May.....	1893	Senasqua.....	1888
Belle D'Orleans.....	1893		
Brant.....	1893	Taylor's Bullitt.....	1885
		To Kalon.....	1888
Burr.....	1893	Union Village.....	1888
Champagne.....	1893	York Madeira.....	1888
China Bigarreau.....	1888	Walter.....	1893
Delicate.....	1893		
Doctor.....	1893	<i>NECTARINES.</i>	
		Red Roman.....	1893
Donna Maria.....	1893	Stanwick.....	1893
Downton.....	1893	Victoria.....	1893
Duchesse de Pallnan.....	1885		
Early Amber.....	1888	<i>PEARS.</i>	
Jeffry.....	1893	Ananas d' Eté.....	1893
		Brignais Des Nonnes.....	1893
Large White Bigarreau.....	1888	Dix.....	1893
Logan.....	1893	Dunmore.....	1879
Manning Mottled.....	1893	Epine Dumas.....	1893
Merveille de Septembre.....	1888		
Ohio.....	1893	Gris D'Hiver Nouveau.....	1893
		Goubalt.....	1890
Osceola.....	1893	Jalousie de Fontenay Vendee.....	1879
Plumstone.....	1893	Kirtland.....	1893
Pontiac.....	1893	Langelier.....	1893
Powhattan.....	1893		
		Le Conte.....	1893
		Oswego.....	1893
		St. Ghislain.....	1893
		Washington.....	1893
		Windsor.....	1893

## SUMMARY OF REJECTED VARIETIES.—CONTINUED.

Names.	Year.	Names.	Year.
<b>PLUMS.</b>		Oblong .....	1892
Admiral .....	1879	President .....	1888
Columbia .....	1893	Pullen .....	1893
Dorr's Favorite .....	1881	Reeves Late .....	1893
Imperial Blue .....	1893	Ruding Late .....	1893
Kirke .....	1893	Silver Medal .....	1893
Monroe .....	1893	Snow .....	1893
<b>QUINCES.</b>		Temple Late .....	1893
Angers .....	1893	Thurber .....	1888
Portugal .....	1893	Tippecanoe .....	1893
<b>RED RASPBERRIES.</b>		Van Zandt .....	1893
Arnold's Red .....	1888	Variegated .....	1893
Bristol .....	1888	Windoes .....	1881
Delaware .....	1888	Wheeler Early .....	1893
Early Andrews .....	1883	<b>STRAWBERRIES.</b>	
Fastolf (Naomi) .....	1888	Afrique .....	1883
Franconia .....	1893	Agriculturalist .....	1888
Highland Hardy .....	1888	America .....	1883
Hornet .....	1888	Arnold's Pride .....	1893
Kirtland .....	1888	Atlantic .....	1893
Montclair .....	1888	Black Defiance .....	1893
Naomi .....	1885	Boston Pine .....	1885
Red Antwerp .....	1888	Boyden (Seth Boyden) .....	1893
Saunders .....	1883	Bright Ida .....	1893
Superb .....	1893	Burgess .....	1885
Thwack .....	1888	Burr Oak .....	1883
Winant .....	1883	Burr's New Pine .....	1888
<b>BLACK CAP.</b>		Caroline .....	1883
American White .....	1893	Centennial Favorite .....	1883
Beebe .....	1893	Champion .....	1893
Canada .....	1888	Cheney .....	1893
Davison's Thornless .....	1888	Cinderella .....	1883
Ellisdale .....	1888	Cornelia .....	1890
Florence .....	1893	Cowing .....	1893
Ganargua .....	1885	Crimson Cluster .....	1893
Golden Thornless .....	1893	Crimson Cone .....	1883
Lum's Everbearing .....	1883	Damask Beauty .....	1883
Miami .....	1893	Daniel Boone .....	1890
New Rochelle .....	1893	Dr. Warder .....	1883
Norwood .....	1888	Downer .....	1893
Ontario .....	1893	Duchess .....	1888
Purple Cane .....	1888	Duncan .....	1893
Seneca .....	1888	Early Canada .....	1893
Wetherbee .....	1888	Early Hudson .....	1883
<b>PEACHES.</b>		Emperor .....	1883
Atlanta .....	1893	Essex Beauty .....	1883
Beatrice .....	1893	Excelsior .....	1885
Bergen .....	1893	Fillmore .....	1883
Briggs May .....	1893	Forest Rose .....	1885
Cole .....	1893	Fowler's Seedling .....	1883
Columbia .....	1893	French .....	1883
Coopers Mammoth .....	1883	Frontenac .....	1883
Delavan .....	1893	Gen. Sherman .....	1883
Downing .....	1893	Gipsy .....	1890
Early Admirable .....	1893	Glendale .....	1893
Early York .....	1893	Golden Defiance .....	1885
Haines .....	1893	Goldsmith .....	1890
Imperial .....	1893	Grace .....	1883
Large White Cling .....	1893	Great American .....	1888
Late Admirable .....	1893	Green Prolific .....	1888
Late Red Rarripe .....	1893	Hervey Davis .....	1888
Macon (Local) .....	1893	Henderson .....	1893
Muscogee .....	1888	Hooker .....	1885
Nonpareil .....	1893	Hudson No. 10 .....	1883
		Hovey .....	1888
		Ida .....	1882

## SUMMARY OF REJECTED VARIETIES.—CONTINUED.

STRAWBERRIES.—*Continued.*

Names.	Year.	Names.	Year.
Indiana.....	1893	Ohio.....	1893
Iowa Prolific.....	1883	Phelps (Old Iron Clad).....	1893
Jewell.....	1893	Photo (Martha).....	1888
Jucunda.....	1893	Pioneer.....	1888
Kirkwood.....	1885	Pres. Lincoln.....	1893
		Pres. Wilder.....	1883
Kissany.....	1883	Romeyn.....	1883
Large Ey. Scarlet.....	1883	Russell.....	1885
Lennig's White.....	1883	Russell's Advance.....	1890
Longfellow.....	1890	Scarlet Globe.....	1883
Longworths Prolific.....	1883	Seedling Eliza.....	1883
Lockhurst.....	1888	Seneca Chief.....	1885
Maggie.....	1893	Seneca Queen.....	1893
Major McMahon.....	1883	Springdale.....	1885
Marvin.....	1885	Shirts.....	1890
Matilda.....	1885	Star of the West.....	1883
May King.....	1893	Star.....	1883
Metcalf.....	1885	Sterling.....	1893
Miami.....	1893	Sucker State.....	1893
Michigan.....	1885	Summit.....	1893
Minnesota.....	1885	Victoria (Golden Queen).....	1888
Monarch of the West.....	1888	Warren.....	1890
Napoleon III.....	1883	Walden.....	1883
New Dominion.....	1893	Wilding Seedling.....	1883
New Jersey Scarlet.....	1888	Windsor Chief.....	1881
Nicanor.....	1890	Woodruff.....	1893

BIOGRAPHICAL SKETCH

OF

PROF. L. H. BAILEY.

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Prof. L. H. BAILEY is a Michigan product. We are proud of his success in life and we are glad the impulse which has enabled him to reach a position in which he can wield a potent influence for good, was given him in our state.

He was well born and his early formative years were spent in an atmosphere which was redolent of fruits and flowers. It was not a mere sentimental appreciation of the good things of horticulture, but the commercial spirit was uppermost, and the all-important question of "Will it pay" was constantly before him. The village of South Haven was his birthplace and the date, 1858, was before our famous peach belt was a matter of great notoriety.

BAILEY's taste, even in his early boyhood, led him into interesting fields of investigation. He had a passion for the acquirement of knowledge in the realm of natural history, and while he was criticised by the older, very knowing ones for chasing bugs and butterflies, hunting wild flowers, and watching the habits of birds, he was nursing the germ which has grown and not only made him famous, but enabled him to do a noble work for horticulture, and none are more proud of his achievements than his early critics.

His early contributions to the programme of the local horticultural society were suggestive of the later lines of investigation which he has undertaken, and in the early official horticultural literature of our state are contributions from his boyhood's pen.

He took the course at our State Agricultural college and was a marked

man in his career there. Aside from rounding out the scientific side of his mind, he began here his work in journalism, a work he has continued in varied lines to this day. His first editorial experience was as manager of the college *Speculum*, before he completed his course of study there. After taking his Bachelor's degree, for a couple of years he enjoyed the great pleasure to any student of botany, of sitting at the feet of Dr. ASA GRAY, America's greatest botanist. On the suggestion of his recent instructor and cherished friend, Dr. W. J. BEAL, he was appointed by Dr. GRAY as assistant in Harvard's famous botanic gardens. This gave him a grand opportunity for development along his chosen lines; and while drinking in the technical knowledge of botany at Cambridge he acquainted himself with the methods of the amateur and professional gardeners about Boston and became a voluminous writer for the agricultural press upon horticultural topics.

It was while engaged here that a vacancy occurred in the chair of horticulture at our own Agricultural college. The state board of agriculture remembered BAILEY'S career as a student and, although he seemed very young, and himself would not have thought of being a candidate for the position, he was called back to his native state and his alma mater. For more than four years he was professor of horticulture, then endearing himself to his students, his associates on the faculty, and to the horticulturists of the state. Horticulture was given a great impetus at the college and became a popular department with the undergraduates. Prof. BAILEY'S college lectures were very entertaining and he succeeded in making usually uninteresting subjects so juicy and wholesome that the young men were tempted to take with him more than their allotment of horticultural instruction.

While occupying a chair at this college his ability as a lecturer gave him many calls to address local horticultural societies, granges, and farmers' clubs, the acceptance of which gave him a large and valuable acquaintance in the state.

In 1886 Prof. BAILEY accompanied a party of botanists and did some excellent work, under the auspices of the Minnesota geological survey, in gathering data concerning the flora of northern Minnesota. A little later he accompanied a similar party which took a trip across the state of Michigan in the region of the jack-pine plains, gathering botanical information and making notes of especial value to forestry interests. In 1888 he took a flying trip to Europe and from that year until the date of this writing he has occupied the chair of horticulture at Cornell university, to which he was called by the trustees of that institution, at the earnest solicitation of leading horticulturists of the Empire state. The position has been a

grand one in which to develop and employ his admirable qualities of mind and heart.

During these later years he has not confined his attention to giving tuition in horticulture to the students of Cornell, but has been teaching in a far broader school; for as editor of *American Gardening*, which in many respects was the finest horticultural publication in the world, he made his impress upon the horticulture of America.

He has written many books, attractive and valuable, illustrative of the progress of the art to which he is devoted. Among them are "Talks AfIELD," "Annals of Horticulture for 1889, 1890, 1891, 1892, and 1893," "The Horticulturist's Rule Book," "The Nursery Book," "Cross-Breeding and Hybridizing," "American Grape Training."

He was associate editor in charge of agriculture, in revising the last edition of Johnson's *Encyclopedia*, and is now engaged in revising Grey's *Field, Forest, and Garden Botany* for the trustees of Harvard university.

As horticulturist of the experiment station at Cornell university, Prof. BAILEY has done some of his best original work, the results of which have been very thoroughly disseminated by means of bulletins and the agricultural press.

But the value of his work centers in his ardent endeavors to elevate horticulture as an art and to emphasize the importance of the close relationship of scientific investigation to progress in skillful methods employed in commercial gardening and fruitgrowing.

The labor and influence which redounds most to his honor and usefulness are his earnest and persistent efforts to popularize rural life and its possibilities, as aided by a knowledge of horticulture, and his stirring appeals for an appreciation and utilization of the natural beauties of the earth, especially in the forms of shrubs, trees, vines, and plants, in making homes more attractive. He has spoken eloquently and written attractively upon the preservation and maintenance of nature's beautiful forms, that are so often sacrificed in "clearing up" a country.

His warm and enthusiastic pleas in favor of choosing an occupation which will not only enable men and women to have attractive dwelling places, but be enabled through their occupation to bring into their lives the sweetest things of the earth, have been a power for good throughout our land in assisting toward more permanency in home life, and a larger appreciation of horticulture as a factor of the happiest existence in this world.

The horticulturists of Michigan, and especially the Michigan Horticultural society, feel honored in pointing to the work of Prof. L. H. BAILEY, in behalf of an advanced horticulture. It gives us satisfaction to announce

his nativity; and when some captious critic of our Agricultural college asks, "What has it done for practical agriculture?" we point to men like BAILEY and say, "The investment of our state is bringing forth through the work of these sons of the college a hundred fold, which is turned directly into the lap of practical agriculture."

In presenting the portrait of Prof. BAILEY as the frontispiece to the volume we indicate our recognition of his services to our society and state.

C. W. GARFIELD.

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BULLETINS

OF THE

AGRICULTURAL EXPERIMENT STATION,

OF

MICHIGAN,

AT LANSING.

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# MICHIGAN EXPERIMENT STATION BULLETINS.

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## PEACH AND PLUM CULTURE IN MICHIGAN.

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BY L. R. TAFT.

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Bulletin No. 103.—Horticultural Department.

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### INTRODUCTION.

The importance of peach and plum growing as productive industries is but slightly appreciated, except by those persons who have visited the large commercial orchards in the fruitgrowing sections, during the shipping season. During the past two or three years the crops have been so remunerative that the acreage has largely increased, and many persons have engaged in growing these fruits who have had little or no experience. In order to handle their orchards successfully they have endeavored to inform themselves as to the best methods to pursue and, as one source of information, this station has received numerous letters asking about the best locations and exposures for peach-growing, the methods and time for pruning, the best soil and fertilizers, the varieties to plant, and the methods of combatting the various insects and diseases.

Appreciating the importance of these crops, and the necessity for accurate information as to the proper way to handle them, the following bulletin has been prepared. In the few pages that we shall devote to the subject, it is our aim to take up such topics relating to the cultivation of these fruits as seem of most importance, and regarding which the most inquiries have been received.

As is well known, it will be difficult to find two fruitgrowers who can agree upon all matters of planting, pruning, cultivation, etc., and it can not be expected that every one will coincide with the methods of procedure here recommended. It must be understood that the character of the soil, of the season, the variety, or the surroundings, will exert such an influence that what may be a proper method of handling an orchard at one time or place, may be unwise at another. On the other hand, while, under average favorable conditions, some particular distance of planting, height of head, and method and time of pruning will give best results, a slight deviation

one way or the other will make but little difference, and the conditions may make it a rational one.

The methods here recommended have been found valuable in our own orchards and are used by the most successful fruitgrowers of the state. Believing that no iron-clad rule will answer for all cases we have frequently outlined two or more methods of procedure and, as we have stated the conditions that would influence our selection, trust that the grower will have no difficulty in making a rational choice.

### THE PEACH AND ITS CULTIVATION.

While it is probable that the peach was grown in Michigan at a much earlier date by the Indians and the early French settlers, the first well-authenticated planting of peach trees in the state was by a Mr. Burnett in Berrien county about 1809, some of which were alive in 1830.\* As early as 1835 the peach crop of Berrien county began to be of commercial importance locally, and in 1839 the first peaches were sent to Chicago market from St. Joseph. From that time the planting gradually increased, not only in Berrien county, but it extended northward along the shore of lake Michigan and in favorable locations in the interior counties. In 1874 there were more than 650,000 peach trees in Berrien county, but the scourge of "yellows" destroyed most of the orchards and spread into the adjoining counties. As a method of holding the disease in check has been found, confidence in the crop as a commercial venture has returned, and in the county of Berrien alone it is estimated that 200,000 peach trees will be planted in the spring of 1894, while large areas will be set in other sections.

In favorable locations the peach has shown itself a profitable crop, and in the words of C. D. Lawton of Lawton, "It is an undoubted fact that the production of peaches in western Michigan, when circumstances are favorable and the cultivator skilled in his work, is one of the most profitable branches of agricultural industry pursued in the United States," while another well-known Michigan horticulturist has said in speaking of this fruit: "The peach is the most delicious, the most beautiful, and the most profitable of all our fruits, and nowhere on this continent is it grown to greater perfection than here in Michigan."

By the "Michigan peach belt" a tract from five to ten miles in width, extending from St. Joseph to Grand Haven, was originally meant, but the "belt" has in recent years both lengthened and broadened, as some of the orchards that have been most profitable are located in Oceana, Mason, and Grand Traverse counties, and even as far north as Charlevoix (Lat. 45° 30') they are grown with considerable certainty. Not only are there orchards which have produced profitable crops in favorable locations scattered all over the lake shore counties, but they can be found in nearly every county south of Montcalm (Lat. 43°), and during the past few years the climatic conditions have been such that, in many sections in the interior of the state, the crop has been nearly as sure as in the famed "peach belt" itself. It must be understood, however, that these orchards are in exceptionally favorable localities and that while they may succeed upon one acre, there will be a thousand where not only the crop, but the trees themselves, will be destroyed in any except the more favorable seasons. With a proper selection of a location, especially if the ameliorating

\* Winslow's History of St. Joseph.

influence of lake Michigan can be secured, with a suitable elevation, a well-drained and properly fertilized soil, and intelligent treatment of the orchards, a crop can on an average be expected in two out of three if not three out of four years. The crop is, therefore, not absolutely a certain one, and judging from the past we may occasionally expect a winter in which, even in the peach-growing sections, the peach trees except in unusually favorable locations will be badly injured, if not killed outright.

#### HARDINESS OF THE PEACH.

While the peach is classed among the tender fruits, it is only relatively so, as, if in good condition, the fruit buds of our best commercial varieties can withstand for a considerable length of time a temperature of twelve or fifteen degrees below zero, and instances have been known where peach trees have been subjected to eighteen or twenty degrees for a short time, and a fair crop secured the following summer.

In a location adapted to peach culture, and with hardy varieties, it is not the extremely low temperatures that are to be feared, so much as the entering on the winter with trees in an unripened condition, or the injury likely to follow the swelling of the buds during a warm spell in winter, while in some localities the danger from late spring frosts is even more to be dreaded. Among the other conditions that will greatly affect the amount of injury done by cold, are the circumstances under which the trees are thawed out. If after a very cold snap, when the thermometer has gone as low as minus eighteen or twenty degrees, the sun comes out bright and an immediate and rapid rise in temperature ensues, the fruit buds will almost invariably be destroyed, and the trees themselves may be seriously injured; on the other hand, if the sun remains clouded and the trees are slowly thawed out, many of the buds may, if they were in perfect condition, escape. Little, if anything, can be done to secure a gradual thawing out of the trees, but an earnest effort should be made to so handle the orchard that the trees will enter upon the winter in as perfect condition as possible. So much depends upon the effect of elevation and exposure, that the intelligent fruitgrower will make a thorough investigation into the climatic condition possessed by a certain locality before selecting it as a site for a peach orchard.

A section of a bud that is in a perfect condition, compared under a microscope with one from a bud in which development has commenced, will show how it is that one may escape while the other is injured. The dormant bud has its scales folded closely together but, in the one that has started, they have a loose, open appearance that causes them to feel the effect of the slightest change in temperature; on the one hand they are easily chilled and, on the other, the thawing out will be so rapid that injury will almost certainly ensue. While the structural condition of the bud itself has much to do with its ability to withstand cold, it is probable that the main reason why the dormant bud is less susceptible to cold is that the vital functions of the tree are at rest while, after the buds have commenced to swell, the cell contents are in an active condition and the amount of water they contain is much increased.

#### INFLUENCE OF LAKE MICHIGAN.

The fruitgrowers in the western part of the state, with orchards within one to ten miles of lake Michigan, have a location that is particularly

favorable. During the month of February, when as a rule the temperature is lowest, and there is the most danger from severe cold, the record for twenty years shows that the average temperature at Ludington is about the same as in Branch and Hillsdale counties, and "careful records kept for several years at Traverse City and Northport show that the mean temperature during the winter months is several degrees higher there than at Ann Arbor" (Sanford Howard, Report State Board of Agriculture for 1867).

The *lowest* temperature to which the thermometer falls is, however, of more importance than is the *average* temperature and, in that respect, the lake, so long as the breezes are from the west, has a marked effect in keeping the temperature above zero. Again, in April it is desirable to have the growth held back as long as possible in order that the buds and blossoms may not be injured by late spring frosts. The observations of the Weather Service show that for the month of April the average temperature at Grand Haven is about the same as in Roscommon county, nearly one hundred and fifty miles further north, while in May the isotherm of Grand Haven crosses the center of the state at Otsego county, or two hundred miles north of its initial point in the state. The lowest limit at Traverse City is about eight degrees F. higher than at St. Louis, Mo., which we think of as well to the south. The prevailing cold winds in winter are from the west and, before reaching the "peach belt," must pass over lake Michigan, which is unfrozen in the coldest weather. It can be readily seen that the cold winds coming across the plains to the westward, at a temperature of from 30 to 40 degrees, when they reach the lake with a temperature from 60 to 70 degrees warmer, will be considerably ameliorated in passing over the eighty or ninety miles of open water between the shores. In fact, the effect produced in extremely cold weather is often as much as twenty-five degrees, so that when it is twenty-five degrees below in Wisconsin, it is not likely to be zero at the same latitude in Michigan. A glance at the map will show that to escape its influence, a wind must come from some point to the east of north, from which direction extremely cold winds are almost unknown. The waters of lake Huron and lake Erie have a slight influence upon the temperature, as is shown by the isothermal charts.

A third effect of the lake is to delay the occurrence of the frosts in the autumn, thus giving grapes, peaches, and other crops an opportunity to ripen. Although the average temperature of the spring and early summer is somewhat lowered by the influence of the cold water of the lake, it has the reverse effect during August, September, and October, so that the average temperature of those months is about the same at Traverse City as in Eaton and Clinton counties.

#### ELEVATION AND EXPOSURE.

Except in the southern part of the lake shore "peach belt" (and even there it should not be entirely overlooked), it is of the utmost importance that proper regard should be paid to the selection of a site for a peach orchard. While we generally speak of elevation as being desirable, it is in a relative sense, principally, that it is of value, as a location upon a hillside where the land slopes off gradually to a valley one hundred feet below is far preferable to one on a level plateau, even though it be two or three hundred feet higher. Cold air is heavier than warm and, if the conditions

are favorable, it will sink to the lowest possible level. A slope of a few feet, down to a little pocket-like depression, will be of but little value as this will soon fill with cold air. What is needed is a depression of considerable breadth or depth, or, if it is only a narrow valley, it should lead into another one into which the cold air can have uninterrupted flow. For this reason it is always desirable to have a stream, even though it be but a small one, flowing through the lower ground. Judge Ramsdell of Traverse City, in "Michigan and its Resources," mentions a well authenticated case where a difference in temperature of eleven degrees was noticed in fourteen feet elevation, where the lower level was in the form of a pocket, but on his own farm he notes one instance of a difference of ten degrees in one hundred feet elevation, where there was a gradual slope towards Traverse bay. As he well says, "A hundred feet elevation, with open air drainage to lower levels, may determine the difference between a crop of fruit and a ruined orchard; and in enclosed valleys, or basins, twenty feet may do the same." The truth of this can be seen when it is understood that peach buds will withstand a temperature twelve or fifteen degrees below zero, while the trees are often killed at twenty-five degrees below. As a rule a hillside is preferable to a hilltop, as a location for a peach orchard, especially if the latter is of considerable extent, and level, both on account of the better air drainage, and because the trees will be less exposed in severe wind storms.

Regarding the best exposure for a peach orchard, it is not possible to offer any set rule, as the seasons and the locations vary to such an extent that it would not apply in all cases, and in all seasons. In one year a north slope will give better results than one with a westerly exposure, while the next year it may be reversed. The following general statement may, however, aid the prospective planter of a peach orchard. While a westerly slope has its advantages, near lake Michigan, as the influence of the water is more marked on that side than on the other, it has the disadvantage of exposing the trees to the full force of the wind and sleet storms from that direction, which often cause great loss both of trees and fruit. The south slope is seldom advisable, as there the temperature often rises so high in bright days in winter, as to swell the buds, which are then likely to be injured by the first low temperature; moreover, and this is perhaps the more common cause of injury, the buds start earlier in the spring, than on the north slope, and are more likely to be destroyed by spring frosts. Another objection to the southern exposure, and one which also applies to an eastern slope, is that the early morning sun will more quickly thaw out the frozen buds, than it will when the trees are planted on the north or west side of the hill. We can only take the average of the seasons and say that in sections, within ten miles of the lake shore, where there is no intervening elevated land, the first choice seems to be the westerly and the second the northerly exposure, followed in order by the slopes to the east and south. In the southern portion of the state, away from the immediate influence of lake Michigan, there seems to be but little choice between the east and west slopes, but the consensus of opinion among fruitgrowers seems to place them in the above order, except that, for some of the late sorts that barely ripen, the westerly slope is generally chosen. As stated above, the climatic conditions of a certain season may make one of the exposures, for the reasons given, by far preferable to either of the others, while the following winter may be so different, that the slope which was least adapted to success the previous year will give best results, and the proper course to pursue

then is to select the exposure which, everything else being equal, has given best results for a term of years.

#### THE SOIL AND ITS PREPARATION.

The location and exposure have so much to do with the success or failure of a peach orchard that they are considered here, before the matter of soil is taken up. This seems to be eminently proper, as, while a variety of soils will give good results, peaches can not be grown with success unless they have a suitable location. It is often said that any good corn or potato soil will do for peaches, but while this may be true it is well to be more explicit. The ideal soil for peaches is a well drained, rich, sandy loam. Not only is it as well or better adapted to the growth of the tree than any other, but they are more sure to bear, will ripen earlier, and the fruit is larger, of better quality, and superior in flavor to those grown on a clay, or clay loam.

Peaches are very susceptible to the presence of water at their roots, and unless the land has thorough natural drainage it should be freed of its surplus water by means of tile drains. The fact that heavy soils are likely to be somewhat wet, owing to their having an impervious hard-pan, is another reason in addition to those above given, why peaches are preferably grown on a light soil. If well drained and at a suitable elevation, good results can, however, be obtained on a clay soil.

While a location where the land is in sod can be selected and the trees set the same season, it is better to give at least one year to preparation, using the land for some hoed crop. If it can be secured, a clover sod turned under in the fall is excellent for an orchard, or for any fruit crop. On light soils, where the sod is thin, it can be brought into fair condition for the trees if plowed the fall previous to planting. Before the trees are set it will be well to replot, although a thorough dragging will answer.

Except in very favorable locations, it is hardly safe to set peaches on new land where there is much vegetable matter in the soil, as it is likely to cause a rank and late growth, which is likely to be winter-killed. After one or two crops have been taken off from the land, the trees can be safely planted. Another reason for delay is that the soil is so light, owing to the presence of the partially decayed roots and leaves, that unless care is taken to obtain clear loam to pack around the roots, the trees are likely to dry out. The leaves and other litter, however, are excellent to place around the trees, upon the surface, as mulch.

#### METHODS AND DISTANCES FOR PLANTING.

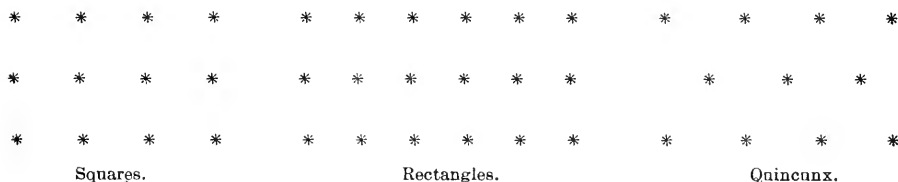
When only a few trees are to be set, the holes can be dug with a spade, but for a large orchard, labor can be saved if two furrows are run so as to open up all of the rows in both directions. This will allow the trees to be set at the intersections of the rows, without the labor of digging the holes by hand. The trees may be planted at various distances and be arranged in several ways. When planted in squares, some growers place the trees as close as sixteen feet each way; very few plant at less than eighteen feet, however, and a majority are now setting their orchards with trees at least twenty feet apart, requiring about one hundred and nine trees per acre.

In some localities it is a common practice to plant in rectangles with the trees from twenty by eighteen and twenty by sixteen feet to twenty by fifteen, or as near as eighteen by twelve feet. At the last distance, the

trees, while small, have plenty of room but, after a few years have passed, they begin to crowd. Such close planting is not advisable unless one has an abundance of trees, when it may be economy of space to plant as above, and, when the branches meet, take out every other one so that they will be eighteen by twenty-four feet. At this distance, almost exactly one hundred trees will go upon one acre. With the trees twenty by fifteen feet there will be the same chance to go between the rows one way as when they are twenty by twenty feet, and one hundred and forty-five trees can be set to the acre, or one third more than when the square is used. After the trees are five or six years old, they will interlace and the crops will be but little larger than would be borne by the smaller number of trees. The same objection will hold against the trees planted twenty-two by sixteen feet, and at either distance it will be more difficult to cultivate than when they are in squares.

A third method of planting, known as the quincunx, or triangular arrangement, consists in arranging the trees in diagonal lines across the orchard, and thus making room for about one eighth more trees than can be planted by the square method, with the trees the same distance apart.

## METHODS OF ARRANGING TREES.



This is an increase worth considering, but the distance between the rows will be decreased in the same proportion, and this is a serious objection. It does not hold, however, when the trees are placed twenty feet apart in the rows and the rows are at the same distance. In this way the same number of trees can be set and there will be an increase of about one eighth in the distance measured diagonally between the trees, which will then be about twenty-two and one half feet apart. While this distance will be desirable on rich soil, if the orchard is to be on light sand or sandy loam, the other may answer.

In laying out the land, it is a good plan to first stake it off into squares not over four hundred feet on a side. If two opposite sides are marked with stakes, at intervals the same as the proposed distances between the trees, the location of the trees can be fixed by stretching a line or wire marked at the proposed distances, and setting stakes at those points. A No. 14 galvanized wire will be found best for the purpose, as it will not stretch, and the trees can be more accurately located. The points for the trees can be marked on the wire by twisting around it a short piece of small wire and fastening it in place by means of a drop of solder. If a garden line is used instead of a wire, one should be selected that will not stretch, and the distances can be marked by tying short pieces of twine about it. The holes for the trees should be about one foot deep and eighteen inches in diameter, varying with the size of the roots and the character of the soil. The trees should be set sufficiently deep that the

old stock will be covered, and the holes should be deep and wide enough to take in the roots without cramping them. Upon soil with a stiff hardpan, it is well to dig the holes considerably wider than is needed by the roots, as it will give them a better opportunity to develop.

In setting the trees, the soil should be carefully worked in among the roots and firmly packed around them, taking pains by first filling the hole half full of soil, that they are not bruised. The fine surface soil should be used for the lower half of the hole, and then, after the roots have been well covered, if they are partly rotted the sods can be put in, filling up the hole with the subsoil.

The surface should be left level or slightly sloping toward the stems of the trees. The opposite plan of mounding the soil around the trees is not a good one except for fall-set trees, or in localities where mice are troublesome, when they may be banked up in the fall and the soil leveled off in the spring.

#### SELECTION OF TREES AND VARIETIES.

One of the pivotal steps in peach-growing is the selection of the trees and the varieties, as, however well the location may be chosen, or with what care the orchard may have been handled, there will be no fruits to reward one's toil unless a judicious selection has been made.

If the grower has the necessary knowledge and can wait two years for his trees, it will be as well, perhaps, if many trees are wanted, for him to propagate them for himself, but the average person will do better to purchase his trees of a nurseryman, who knows how and has the time to grow and care for them in the best manner. Everything else being equal, it is better to obtain nursery stock of all kinds from a nurseryman in the same locality, or where the soil and climate will be similar to that of the orchard. If purchased near home it will enable one to select the trees in the nursery, and there will then be a better opportunity to get trees that are satisfactory. In case the local nurseries are not patronized, the next best thing is to write to some of the large nurseries of this or adjoining states, giving the number and age of the trees, the names of the varieties desired, and any other facts, and ask for prices. Before giving a large order it will be well to have samples sent on for examination, and if everything is satisfactory the trees could then be ordered from the man who furnishes the lowest estimate, with a fair degree of safety. With all nurserymen, however, this will not be a safe thing to do, as a low price may mean inferior or worthless trees, and (although there should be a distinct understanding that there is to be no substitution) inferior varieties. If one is familiar with the standing of the different firms, and if the samples are satisfactory, it becomes a plain business transaction, and the trees ordered will be most likely true to name and up to the standard in size and general appearance.

Many persons advocate the purchasing of trees from local tree agents who are known to be honest and reliable, but if a large number of trees are wanted you can obtain them from the nurseryman, at as low a price as can the agent who must charge for handling the trees, and besides, since they must pass through the hands of a third party, there is the increased risk that the varieties are incorrect, or that the trees will become dry or injured in some way. The fruitgrower has little use for the average traveling tree agent; although many of the so called tree peddlers are honest, understand

their business, and sell trees true to name and at fair prices, the proportion is very small. Too often they fill orders for new and high-priced varieties, with seedlings, or with cull or surplus stock, made up of any and all varieties purchased from some grower. As a rule his prices for trees of standard varieties are from two to five times what they can be obtained for direct from the nurseryman, and the novelties, many of which are frauds on their very face, have not been sufficiently tested to determine their value, and are seldom worth the price charged for them. While the large grower can not, as a rule, afford to get his trees from a tree agent, there may be instances, when only a few trees of common sorts are wanted, when the order can be given with safety, if the agent is known to represent a reliable firm, and the trees can be obtained as cheaply as when obtained direct and the carriage paid. The general rule can be given, that it is unwise, from a commercial standpoint, to order from an agent a novelty of which nothing is known except what can be learned from the gorgeous plates he shows, and his lauding words.

It has been stated that it is well to purchase trees grown in a similar climate and soil. This is not because other trees may not be as good of themselves, but because trees placed under conditions unlike those under which they have been grown are obliged to accustom themselves to the changed conditions. This is especially true of trees grown in a warm climate, where the soil is rich and moist, and carried to a cooler climate with a short season and a dry, sandy soil. The original growth will be soft and watery, and with the usual amount of roots found on nursery trees it will be found necessary to cut the top back severely, thus giving an added check to the trees. It is not uncommon, when the large, bare stem is exposed in this way, for the bark to be burned, and if the tree recovers at all it will not be for several years. These conditions and results are more common with the cherry and pear than with the peach.

#### AGE AND SIZE OF TREES.

A tree one year from the bud is of the proper age for planting, and anything older should be rejected at any price. In digging a two-year-old tree, all of the branching roots are cut off, and when set out it does not recover itself until the second year, by which time a vigorous one-year tree will have caught up with it, and will soon outstrip it. A medium-size tree is best to plant, a large tree with its soft, watery stem and branches being rejected for the reasons given above. Trees whose small size is owing to a poor soil, or unfavorable season, may, if placed in good soil, make a satisfactory growth, but it is often the case that the small size of cull trees is owing to some inherent weakness in the stock or scion, and, although they may in time outgrow it, the slight saving in price is not enough to insure the risk.

Of fully as much and probably of more importance than the size and shape of the top is the condition of the roots. They should be well-branched and the divisions should not be less than six inches in length. While this will not be the entire length of the roots in trees one year from bud, the tissues of the roots will be so soft that rootlets will readily be sent out.

#### CARE OF THE TREES BEFORE PLANTING.

If a grower raises his own trees they should be dug in the fall and carefully heeled in, in some well-drained place, convenient to the orchard site.

The trench should be dug one foot deep and two feet wide, in which the trees should be placed, slanting toward the south at an angle of 45°. If placed in single layers so that the soil can be thoroughly worked in between the roots, they will come out in the spring in good condition.

Care should be taken to select a spot free from stubble or other litter, and no straw or hay should be used to cover the trees, as it would invite the field mice which might work havoc with them. If in a wind-swept spot it would be well to cover the trees with evergreen boughs, or to provide some similar windbreak, but it is hardly advisable to bury the trees in the soil. If the trees are purchased, it is best to obtain them in the fall and heel them in, as above described. By thus doing, you are more likely to get the first pick of the trees, while if left until spring the desirable varieties are likely to be sold out, and only culls left. Besides, in the rush of the spring packing there are more chances of errors occurring and the packing may be put off until the buds have started, and a delay in transit is more likely to cause the trees to dry out, or heat, than in the cool weather of late fall.

Whether purchased or grown, precautions should be taken not to expose the roots to the sun or drying winds. Blankets, tarpaulins, or straw should be at hand to cover them, and if to be left any length of time, when there is danger from either sun, wind, or frost, they should be heeled in. It frequently happens that trees become dry or shriveled in transit, so that if planted in that condition a large part of them will be lost. If not too far gone, the bark and buds can be induced to fill out so that the tree will be far more likely to grow, if it is buried tops and all for a week or ten days in moist soil.

When trees are shipped any distance, a considerable saving in the cost of boxing and freight would result if they are trimmed before they are packed. The nurseryman can do it as cheaply as the planter, and a saving of from two to five dollars can be made on each thousand trees, if they are pruned as described later on.

#### SELECTION OF THE VARIETIES.

In making out a list of varieties of peach for planting, the first consideration should be the hardiness of the trees and of the buds. Many of the kinds that are spoken of as shy bearers are so only because the fruit buds are so tender that in an average year they are destroyed; of course such kinds are of little value and should not be considered in selecting varieties, especially for a commercial orchard. Many of the kinds that are valuable in the states to the south of us do not mature in Michigan and all such should be ruled out. Whether for home use or market, a list should be chosen that will furnish fruit in succession throughout the season.

The varieties should be regular and abundant bearers, and the fruit produced of good size and showy in appearance. The flesh should be firm enough to ship well, yet fine, juicy, and melting, and of a rich, luscious flavor. For most markets a free-stone peach is desired. While a variety with yellow skin and crimson cheek is very attractive, those with white and red are perhaps equally valuable. A moderately thick skin is desirable in a peach for distant shipment, but its quality is to the same extent lessened, while a thick, fuzzy covering is in no way of value and detracts much from the worth as a dessert fruit and for market purposes. As is the case with most fruits, it is impossible to combine all of these qualities in a high

degree in a single variety, as, if they are of high flavor, rich, and melting, they are generally deficient in hardness.

One of the difficulties in offering a list of fruits is, that sorts which succeed well in one locality do not seem to thrive in another. If the most successful fruitgrowers in the state were asked to furnish a list of their most profitable varieties, the ten sorts having the most votes would be: Hale, Lewis, St. John, Richmond, Barnard (or Snow's Orange), Jacques, Gold Drop, Late Barnard, Hill's Chili, and Smock.

Although the above varieties have been found to succeed quite generally, attention should be paid to the character of the soil in making out a list for planting.

Hill's Chili needs rich, well-drained soil, as, if planted upon light sand, the fruit will be under-size, and upon cold, wet land they are very fuzzy, and late in ripening.

The Barnard is another peach that needs a fairly rich soil, but it does better upon one that is of a sandy rather than of a clay nature.

Conkling and Wager seem to thrive upon a rather heavy soil, while Hale, Lewis, Jacques, Gold Drop, and Smock are generally fruitful upon either sand or clay.

As varieties for home use that are of rather better quality, but less hardy in fruit-bud, Honest John, Mountain Rose and Oldmixon may be used, and in favorable locations they will be found good market sorts.

Salway is an excellent late variety but should not be planted except in favorable localities, as it requires a long season. These kinds with, if desired, a few Alexander (or Waterloo) and Early Rivers for early sorts, can be generally relied on in all parts of the state, where any of the varieties will grow. The following lists for orchards of one thousand trees have been submitted by the well-known, successful peach-growers, whose names are prefixed:

J. N. Stearns, Kalamazoo: Hale's Early 50, Lewis 50, Richmond 100, Barnard (or Snow's Orange) 100, Jacques Rareripe 100, Kalamazoo 300, Gold Drop 200, and Smock 100. J. F. Taylor, Douglas: Wilder 25, Rivers 25, Hale 25, St. John (Lewis or Mountain Rose) 100, Early Barnard 100, Jacques 100, Late Barnard 100, Hill's Chili 100, Bronson 100, Engle's Mammoth 100, Gold Drop 100, Smock 100, Allen 25. A. Hamilton, Ganges, recommends the following: Waterloo, Rivers, Hale, St. John, Barnard, Early Crawford, Engle's Mammoth, Bronson, Hill's Chili, and Smock. "I would omit Late Crawford, because it is a shy bearer, and let Engle's Mammoth and Hill's Chili take its place." It will be noticed that none of the large yellow peaches of the Crawford class, such as Early and Late Crawford, Foster, Red Cheek Melocoton, and Susquehanna are included, and the fruitgrower will say that they are such shy bearers that he can get five bushels of almost any of the kinds recommended to one from the Crawfords. While they are excellent in fruit, there are few if any sections of the state where they are sufficiently reliable to merit their being planted upon a large scale as market sorts.

There are a large number of new sorts that have been sufficiently tested for us to say that they are worthy of planting, but from our present knowledge they can hardly be placed in a short list. The most promising are: Kalamazoo, Elberta, Engle's Mammoth, Beer's Smock, and Crosby. Other varieties that have a local reputation are Brigdon, Corner, and Gudgeon. While several of these are undoubtedly seedlings, it is quite likely that others are old varieties whose names have been lost. Several growers

who have watched them carefully are propagating and planting them exclusively. C. Engle of Paw Paw also has a large number of new sorts, mostly seedlings of Hale, Crawford, and Chili, that in some respects are better than the parents, and are being watched with much interest. From its behavior with its originator (J. N. Stearns), the Kalamazoo promises to be one of the most profitable peaches, and is certainly worthy of a trial on a somewhat extensive scale.

#### WATERING THE TREES.

As generally applied, the water given to trees at the time of, or after, transplanting does more harm than good. If the roots of the trees are not exposed to drying winds, and if the soil is not unusually dry from a prolonged drought, no water will be necessary. If, however, the soil is dry, it will be well to give a thorough watering at the time of transplanting. This can best be done by filling the hole half full of soil and working it around the roots as recommended above, except that less care is required than when no water is to be applied. Then fill up the hole with water, and after it has soaked in the planting can be completed. The water will not only moisten the soil, but will puddle it in around the roots much better than could be done in any other way. As a rule, no other watering will be necessary, but if it becomes desirable it should be done in much the same way, the soil being drawn back from around the trees so as to form a basin for the water, and after it has soaked in the soil can be replaced.

The stirring of the soil of itself will be a benefit to the tree, and if applied in this way it will soak down to the roots where it will be of use. As generally applied, none of the water reaches the roots, and although it may benefit the tree for a few days by checking evaporation from the soil, it soon dries out and, a crust forming, the evaporation is increased and more harm than good is done to the tree. The one thing that is most necessary, to secure growth in a tree, is to so conserve the moisture in the soil that at all times it is present about the roots. As all the food taken from the soil by the root must be in a solution, the importance of this can be seen. If a crust can be prevented from forming, the evaporation will be decreased and any light, open material spread over the surface will add in the retention of the soil moisture. A mulch of almost any vegetable matter is excellent for the purpose, and waste hay, straw, or cornstalks are often used. They have one serious fault, as they induce the roots to grow in the moist surface soil, and for this reason are not desirable with the peach and other trees that are liable to injury during the winter.

The orchardist has, however, a mulch at his disposal that is easier to apply than those mentioned above and is in every way is preferable. It is secured by stirring the surface soil to the depth of perhaps two inches, once in a week or ten days during the dry weather. In the early spring, when the ground is full of moisture, it is well to aid in drying out the surface by working to the depth of three or four inches, but later on, when the opposite condition is necessary, the depth should not be over one and one half to two inches. If some shallow-working tool is used during a dry summer, it will be found that, although the surface soil which has been loosened has lost its moisture, the underlying soil in which the roots feed has been able to retain its moisture by the mulch-like action of the surface soil.

If for any reason it is not possible to give the care outlined above, a mulch should be put on covering a space at least three feet more in diameter than the hole dug for the tree. This should be left on until the middle of August when it should be removed to allow the trees to ripen off for winter. In localities where field mice are not troublesome the mulch may be replaced around the trees as soon as the ground freezes, but otherwise it is not safe. While some hoed crop can be grown in a young orchard for two or three years, with little injury to the trees, it is not advisable to use those that will require much stirring of the soil to harvest them, during August or September. For this reason the potato is not a good crop, except in case of late varieties that are not harvested until after the middle of October. Corn, late cabbages, squashes, tomatoes, melons, and similar crops that need cultivation up to the first of August, or that will allow the trees to be worked up to that time, should always be chosen, and in no case should anything be grown within three feet six inches of the trees, and if given four or five feet it would be better for them. For the reason that the trees can not be cultivated, a grain crop is not advisable. It is a mistaken idea that cultivation will cause a late growth and consequent winter-killing. Improper cultivation may do it, but, as recommended above, there need be no fear. If a strip four feet wide on each side of the rows is kept cultivated, the remaining ground may be seeded down, the first year or so. Fruit trees, like most other plants, make their growth during the early part of the season, the period during which the branches of any one kind of tree elongate, varying with the character of the season, as influencing the food supply. When very dry, during the month of July, the trees stop growing prematurely and at once begin to ripen their wood for the winter, storing up in the meantime materials for the next year's growth.

If, after this period of partial rest, the climatic and soil conditions are favorable to a renewal of growth, *i. e.*, warmth and moisture present—the buds, that should remain dormant until the following spring, will expand and a second growth will ensue. In this way we can account for the blossoming of peach, plum, and other trees in September and October. The wood thus formed will not ripen properly and the buds will be so imperfectly developed that the growth the next spring will be very weak. The regular and uninterrupted stirring of the soil during the months of May, June, and July will conserve the moisture and tend to prevent a premature cessation of growth.

If not continued later than the tenth to the fifteenth of August, the wood will have an abundant time to ripen and there will be no danger either of unripened wood or of a second growth. As oftener practiced, however, cultivation may do harm. The orchards are worked during May and June, but, as the other work is pressing, no cultivation is given during July and August, until, as the ground is getting weedy, it is dragged in September; a drouth in July will stop the growth before it is completed, and the late cultivation joined with warm rains will almost surely promote a second growth, to be injured by the winter. In a general way, the cultivation should be about the same, during the next one or two years, as for the first year after planting, but after the fourth year, at latest, it is hardly advisable to crop the land unless the trees are at least twenty feet apart. In some localities it is a favorite practice to sow rye broadcast, the last time the ground is worked in August and turn it under the following spring. It is claimed that the growth of the rye aids the trees in ripening off by

taking from them some of their food supply and thus lessening the danger of a second growth. It also admits of later cultivation. The decomposing rye will add nothing to the supply of plant food, but it will place in the soil a considerable amount of humus in an available form for the use of the plant, and will be of value in lightening up a heavy soil. Especially in the dry seasons and for bearing trees of late varieties, it is well to keep up cultivation until the end of August as the moisture thus conserved will increase the size and hasten the ripening of the fruit. With kinds that tend to overbear, such as Hill's Chili and Gold Drop, moderately late cultivation will enable them to carry a much larger crop and develop it to a good size, than if there is no cultivation after the first of August.

#### PRUNING AT TIME OF TRANSPLANTING.

As a rule, if the trees have been properly dug, the roots of one-year-old peach trees will need but little pruning. At best, the roots that have been bruised or broken should be smoothly cut off, and it is generally well to smooth off the ends of all roots over one fourth of an inch in diameter that have ragged ends. While by no means necessary, it will hasten the callousing and thus enable the trees to throw out roots earlier in the season. It will be best to have this done in the fall as it will enable the trees to form the callous during the winter. In fact, if trees are dug in the fall any cutting of the roots in the spring may do more harm than good. The pruning required for the top of the peach is unlike that required for any of the other fruit trees, except such as are also planted when one year old, when it would be the same. Nearly all growers now cut back their peach trees to a single stem, removing all branches close to the stem and cutting this off about one foot above the point from which the lowest branches are to start. The strong axillary buds will then develop into vigorous shoots. A modified form of this pruning is to leave four or five of the branches arranged at intervals along and around the stem, cutting them off so that one strong bud will be left on each, while others go still further and cut the branches so as to leave five or six with a length of about six inches. Although good trees can be grown from either method of pruning, the first is preferable, as the growths made will be stronger than they would be by either of the other methods. For nearly every situation it will be best to start the trees so as to form a moderately low head, and if the first branches are two to two and one half feet from the ground it will be in accordance with the methods of the best orchardists. If started with low heads, the trunks will not only be short but they will

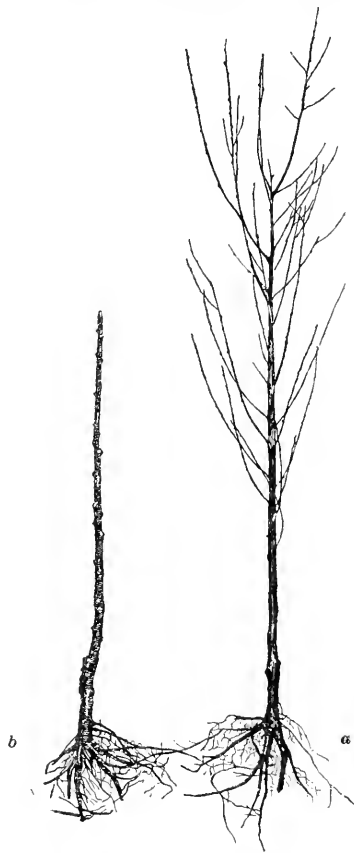


FIG. 1.—NURSERY TREES.  
a unpruned. b pruned.

be shaded from the hot sun and less likely to be injured by the freezing and thawing of winter. Short trunks will bring the branches nearer the ground and will facilitate the pruning, thinning, and gathering of the fruit. The low heads should not be carried to the extreme of starting at the ground, as this would hinder proper cultivation and favor the workings of the borer.

#### FORMING THE HEAD.

Some growers, after heading the trees in, do not attempt to do anything toward forming the heads until the following spring, allowing them to grow as they please during the summer unless they become quite noticeably misshapen, while others go around occasionally and rub out the surplus shoots. In the spring the head is formed by selecting four or five strong branches so located as to be well distributed along the stem for a distance of one foot down from the top and pointing in different directions, thus forming a well balanced head. A strong branch with an upright tendency should be selected as a leading shoot. It will be found preferable to have the branches somewhat distributed, as they will be less likely to break down later on than if they were all crowded together at one point. The side shoots that are left should be cut back about one half their length. The leader should be kept somewhat longer and trained so that other branches will be given off from it. If this is done it will be found much better than to have all the branches needed to form the head developed as side shoots from those left upon the tree when the head was first formed.

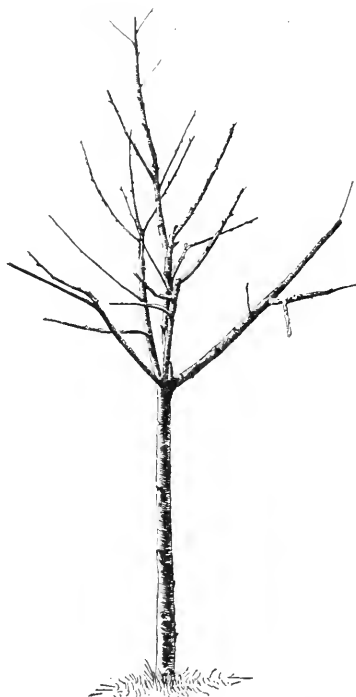


FIG. 2.—PRUNING AT END OF TWO YEARS.

#### PRUNING THE TREES.

After the first year, as a rule, only one annual pruning is given, although, if any shoots are noticed that are out of place, it is well to remove them at any time.

The spring is considered to be the best time for the pruning of the peach, and for that matter of all trees, the work being performed after the severe weather of winter is over. For the best results a peach tree can carry about so many branches and so much fruit, and to secure this one of the following two methods of pruning is commonly employed, the first being to head back, the other to thin out the small branches. By heading back the branches a low, rounded and symmetrical tree is secured, from which the fruit can be readily thinned and picked; the buds remaining will develop a few strong shoots, well back toward the base of the branches, the tree will be less likely to break down, and the stem and main shoots, being sheltered from the sun, will be more vigorous and healthy

and consequently the trees will be long-lived. When pruned by the other method, the small branches along the shoots being removed, there is only a brush-like tuft of twigs at the ends of long, slender branches. As a rule,

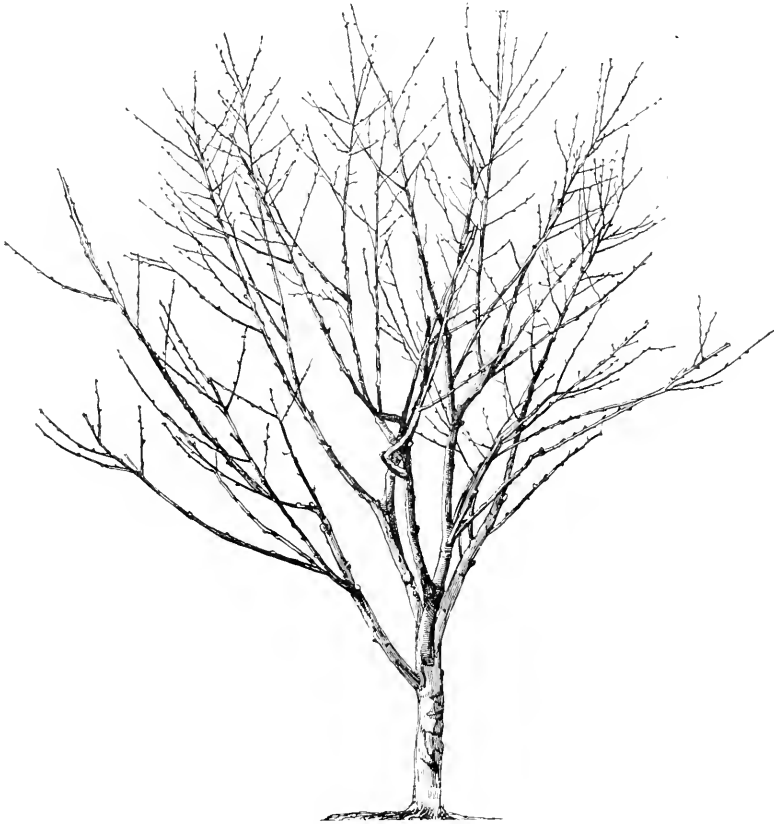


FIG. 3.—PRUNING BY HEADING IN.

growth takes place from a number of weak buds near the end of the branches, and the shoots thus formed transmit their own weakness to those to which they give rise. The fruit being formed at the extremities of the pole-like and comparatively weak branches, the weight, with the increased leverage, often breaks them down. The sap must pass the entire length of the branches before it reaches the fruit, and the amount of plant food provided will consequently be less than when upon short-branched trees, with a comparatively large amount of sap wood, since the fruit buds are formed on the last year's growth. When the heading-back method is used, much can be done toward the thinning of the fruit, and, for that reason, it should be delayed as long as possible in order to obtain a correct idea of the condition of the buds, and thus prune judiciously. If all of the buds have been destroyed, the last year's growth should be headed back severely, leaving only one or two strong buds, in this way keeping the trees in as compact a form as possible. If only a few scattering fruit buds are alive, only the ends of the shoots should be cut back, thus leaving

practically all of the buds to develop; but, on the other hand, if most of the buds are alive, the shoots can be cut back one half or two thirds and thus about one half of the work of thinning the fruit will be saved. While

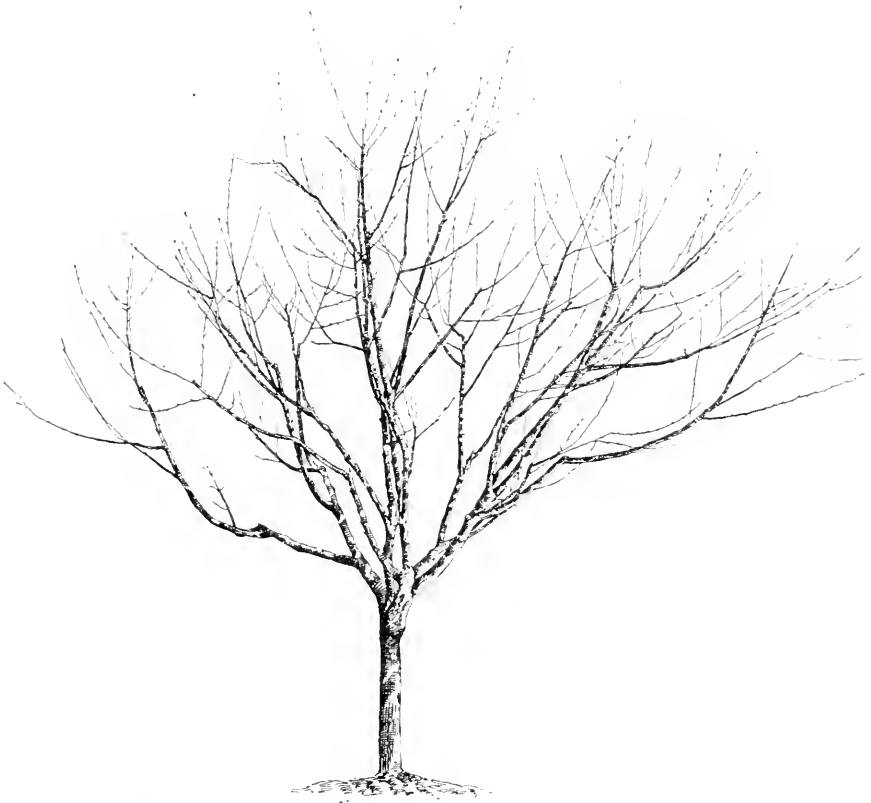


FIG. 4.—PRUNING BY THINNING OUT.

it is best to prune before the trees blossom, the pruning can not be used to thin as judiciously as when delayed until it can be determined how much fruit has set.

#### CROTCHES.

If there is any rule that should be uppermost in one's mind when pruning, it is "avoid crotches," as, whenever two branches of about equal size form a fork, it can be put down as absolutely certain that in time one, or both perhaps, will break down. If possible, one of the shoots should be cut out while small, but if they occur in large trees it will be safer to cut one of them out and head the other back, so as to cause it to send out side branches, than to leave it to break down the tree. In case the pruning has been improperly done and a tree divides above its trunk into two branches of equal size, forming a distinct crotch, so that the symmetry would be greatly injured by cutting out one of them, both can sometimes be saved by clamping them together by means of a bolt, thus relieving the crotch from any strain.

## CROSSED LIMBS.

A second thing to have in mind is to remove all branches that seem likely to interfere with each other. Although it is less common than in the cherry and pear, the branches of peaches cross each other and become partially girdled by the chafing that ensues. As soon as they show any tendency to cross each other, the one that can best be spared should be cut out. While it is desirable to have the head thick enough to keep the sun from burning the bark of the limbs, and to have the main branches clothed with fruiting shoots back to within four or five feet of the main stem, the mistake must not be made of keeping the heads so thick that the sun can not get in to color the fruit. When well laden, although some of the centre shoots may maintain their upright position, the side branches will be sometimes drawn down by their load of fruit and the sun can thus get down among the branches. If, however, the branches are so thick as to prevent this, some of the weaker ones should be cut out, in addition to the heading back that is given the others. A pair of pruning shears will be all that is needed for the removal of the surplus branches if the work is not neglected. However, although its excessive use will shorten the life of the tree, a saw must sometimes be resorted to. Whatever method of pruning is employed, the cuts should be as smooth as possible, care being taken not to bruise the bark, or tear it down the stub. While no general rule can be given for the place of making a cut, it can be said that, when cutting back a branch to the main shoot, care should be taken not to leave any projecting spur, and the wound should be as small as possible.

As a rule, the cut should start from an eighth to a fourth of an inch from the main branch and come out in about the middle of the thickening which is generally present on the under side. When made parallel with the main branch the wound is unnecessarily large, and it is better to have it made 10 to 15 degrees from a parallel. In heading back a branch the cut should be made at an angle of  $45^{\circ}$ , just beyond a strong bud or branch.

## THINNING THE FRUIT.

One of the most difficult things about peach-growing is to have the trees properly thinned, as few men without previous experience will remove enough of the fruits even if those left upon the trees are properly distributed. Not only will there be as many bushels of fruit upon a properly pruned tree, as on one that has twice or three times as many fruits, but the peaches, being larger and handsomer, will sell readily at a highly remunerative price, while others of the same variety, that have been given exactly the same care except that they were not thinned, will be a drug in the market at any price and may not bring enough to pay charges. It is extremely unprofitable not to thin the fruit, and it will also be found a short-sighted policy, as the trees will be greatly weakened by the strain of supplying the phosphorus and other mineral elements required for the formation of the excessive number of pits. The large, thinned fruits contain only perhaps one third as many pits as the others, being largely composed of the flesh, which is mostly water. The mineral elements are most likely to be wanting in the soil, and are consequently most difficult to obtain; since they are required in large quantities in the pits, it can be readily seen that the practice of leaving the fruit unthinned is very exhausting to the trees and will so lessen their vitality that the growth will

be checked and future productiveness lessened. If a tree is left unthinned, particularly if the summer is a dry one, it often attempts to relieve itself by dropping part of the fruits; and, as they are somewhat loosely attached, a heavy wind-storm may strew the ground with the half-grown peaches, oftentimes taking nearly the entire crop. While the trees would have been more likely to retain the fruit had they been thinned, there would also have been a much less serious strain to the tree, as the small number of pits formed would take less mineral food. In some seasons the fruit drops badly soon after it has set, from the effects of curculio, curl, extremes of moisture, or other causes, and for this reason the thinning should be delayed as long as possible without drawing on the trees too much. If done just before the pits begin to harden, as a rule, there will be little loss from dropping after that time. The fruit will be about the size of a natural peach pit, and it will be early enough to avoid a strain to the trees. The time will vary with the season but, as a rule, the 12th to 18th of June will answer in southern Michigan and the 15th to 25th in the northern half of the state. In localities where the rose chafer is troublesome, it will be well to at least delay the final thinning until danger from them is over. In thinning the fruit, no set rule can be given, as it varies with the size and vigor of the tree, the variety, and with the amount (if any) the tree has been headed back. The old rule, when trees were not headed back, was to leave a peach every six inches upon the branches, and it is a safe rule to follow under those conditions, but when the fruit has been partly thinned by heading back it will not answer. If evenly distributed over the tree, and when the branches are clothed with soft, spur-like branches, it will be well, as a rule, never to leave more than two peaches upon any branch unless it is long and unusually strong, and not to have them under any conditions nearer than four inches from each other. On the other hand, if the side branches are not numerous, and if the shoots are cut back very severely, the distance may be somewhat lessened and the number increased. In thinning, an effort should be made to leave the peaches as evenly distributed as possible, making due allowance for the size and strength of the branches. The larger fruits, and particularly those near the base of the shoots, should be left and the others removed. With a little experience, a tree can be very readily thinned, particularly if it has been well headed back, which, as noted before, will greatly reduce the number of peaches that need to be removed with the hand; and lessening the height renders the operation much easier, as most of the work can be done from the ground. The length of time required to prune a tree varies to such an extent with the size and height of the tree and with the number of fruits to be removed, that no estimate of the expense can be given. It can be safely said, however, that the cost will be several times repaid, to say nothing of the benefit to the trees. If when thinning the trees the peaches are thrown into a basket and burned, a great number of curculio will be destroyed and future attacks lessened. When peaches are properly thinned the danger from rot will be decreased, as it is a common occurrence to have one diseased peach transmit the rot to all others in contact with it, and when crowded together the rot will be much more likely to appear, than when the fruits are arranged singly.

#### MANURES AND FERTILIZERS.

So much depends upon the condition and natural fertility of the soil, that only general rules for the application of manures and fertilizers can

be given. If the soil is in condition to furnish a good clover sod to be turned under, no better preparation can be furnished, and frequently it will supply plant food until the trees come into bearing. If the clover sod can not be secured, and if the soil is not rich enough to grow a good crop of corn, some manure or fertilizer should be applied. The application of ten tons of decomposed stable manure broadcast, before the land is dragged in the spring, will supply food for the growth of the trees and for the crops that may be grown between them; a method of supplying food to the trees, without feeding the other crop and by the use of a comparatively small amount of manure, is to spread three or four forkfuls evenly over spots four or five feet in diameter, where the trees are to be planted. In any case, it should be incorporated with the soil and not allowed in contact with the roots. While the application of stable manure is advisable for the young trees upon poor soil, rather better results in some respects can be obtained when they are of bearing age, particularly upon soil that contains a fair amount of organic matter, by the use of the so-called mineral fertilizers. It is known that if we supply plants with potash, phosphoric acid, and nitrogen they can, as a rule, obtain the remaining elements needed for their growth from the soil and atmosphere. The nitrogen is necessary for all growth of plants, but if present in excess it is likely to cause a soft, watery growth. It is generally present in sufficient quantities in soils of fair fertility to carry the trees up to the bearing age, provided the soil is not robbed of its fertility by other crops. Phosphoric acid is also found in all parts of plants, but is particularly abundant in the seeds, and as soluble phosphoric acid is gradually removed from the soil by successive crops, there are few bearing orchards that will not be benefited by its use as a fertilizer. We have at hand materials that supply these elements in a concentrated form, at prices no higher than would be the cost of the more bulky stable manure, when it has to be hauled any distance.

One of the best fertilizers for orchards will be found in unleached wood ashes. They contain all the elements needed for plant growth, except nitrogen, and these are present not only in about the proportions needed by the trees, but they are in combinations that can be readily taken up by them. A good sample of wood ashes should contain about three to five per cent. of potash, and one and one half per cent. of phosphoric acid; if they have been leached or washed by rains the amount will be considerably reduced, while in some cases the amount of both potash and phosphoric acid is fifty per cent. larger than is given. From a half peck to a bushel of wood ashes per tree, according to the size, can always be used to advantage, and if the trees are large, so as to cover the ground, it will be best to use from 100 to 150 bushels per acre, scattered broadcast, covering the entire ground. Since ashes tend to render a clay soil still more tenacious, care should be taken that they are not applied in large quantities upon stiff soils.

Among other sources of potash are the German potash salts, which are imported as muriates and sulphates, and contain varying proportions of chloride of sodium (common salt), and chloride of magnesium. The best grades contain about 50 per cent. of potash, and are preferable to the cheaper ones, as the expense of transporting the worthless materials in the lower grades makes the potash cost more per pound than in the higher grades.

From one half pound to three pounds per tree, or from fifty to three hundred pounds per acre, should be applied, taking care it is not brought in too close contact with the roots. In soils deficient in potash it must be applied

to secure a proper development of the trees and it will also increase the amount of sugar and heighten the color of the fruit.

The best source of phosphoric acid is from bones, either ground or as bone charcoal. The value of ground bone depends to a considerable extent upon its fineness, and the action will be hastened if it has been treated with acid and rendered soluble, in which case it forms what is known as a superphosphate. Fresh bones contain a small amount of nitrogen which adds to their value. A fair sample of ground bone should contain rather more than 20 per cent of phosphoric acid, of which about one third can be utilized by plants; while the remaining 15 per cent. is in an insoluble form, it will gradually become available. The amount of nitrogen in ground bones is quite variable but is seldom less than 2, or more than 5 per cent. In addition to the fresh bones, bone charcoal in the form of dissolved bone-black is also used as a source of phosphoric acid, it containing some 16 to 20 per cent., nearly all of which is immediately soluble. Nitrogen is not present in bone-black, having been removed by the burning. Phosphoric acid is also obtained from various waste products of slaughter-houses, from guano and fish scraps and, in less valuable forms, is mined at Charleston, South Carolina, and in Florida, and is found in iron slag. The Charleston phosphate rock is largely used in fertilizers, but its phosphoric acid is less valuable than that from bones. The iron slag phosphate, sometimes known as "Odorless," is highly commended by many who have tried it. Although it has some value, the extravagant claims made for it can hardly be sustained. Analysis shows that it contains about 20 per cent. of phosphoric acid, of which some 3 to 4 per cent. is soluble.

The nitrogen supply, except as furnished incidentally in the bones and waste animal products, is obtained from nitrate of sodium and sulphate of ammonium. In both of these salts it is readily soluble and is considered more valuable than when from other sources. The quantity of the salts required varies with the character of the soil as well as with the age of the trees. Stable manure is preferable as the source of nitrogen, but if it can not be obtained, and the condition of the soil is such that some form of nitrogen is needed to give a fair growth to the trees, 100 to 150 pounds of either of these chemicals per acre would generally be ample, while a considerably smaller quantity would suffice for young trees. There is much danger if it is used in large quantities, particularly if it comes in close contact with the roots. One can determine the relative value of the various fertilizers, as their guaranteed analysis must be furnished, and with this and the value per pound of potash, phosphoric acid, and nitrogen it can readily be computed. Potash is reckoned as worth about 6 cents per pound when in the form of sulphate and five cents as a muriate. Phosphoric acid when soluble is valued at eight cents, reverted at seven, and when insoluble in bones it is valued at from three to seven cents, while in rock and similar materials it is only worth from one to two cents at the most, while from some materials it has little if any value. The variation in the value of nitrogen is still greater, as in nitrate of soda it is worth sixteen cents per pound; as sulphate of ammonia eighteen cents; in blood, meat, and fish scraps fifteen cents; in bones from ten to fifteen cents according to the fineness of grinding. In stable manure nitrogen would be worth about eight cents per pound. As they are for the most part readily soluble, it is best to apply the fertilizers in the spring; if this is done just before the land is to be harrowed it will be better than to plow it in. In seasons when

droughts prevail there is less effect from fertilizers than from stable manure, but, although there may be some loss of the nitrogen and potash, the phosphates will be retained in the soil with little or no loss.

#### THE RATIONAL USE OF FERTILIZERS.

As nearly all, if not quite all, soils contain a considerable amount of lime, there will be little use in applying lime in any form for the sake of supplying that element to plants, and the same can be said of sodium and chlorine; and, as these elements make up our common salt, it will be seen that salt is of no value to any crop as a fertilizer. Of the three elements mentioned above that are often deficient in the soil, potash, phosphorus, and nitrogen, it can be said that a rich virgin soil will generally contain all that is needed for an orchard; but, after the trees have matured several crops of fruit, the available potash and phosphorus is likely to become so reduced that a satisfactory growth can not be obtained, and if the soil is in any way deficient in organic matter the amount of nitrogen will probably be rather small. In order to determine what one of these elements is lacking, and the amount that should be used, it is well to make use of them experimentally, applying, for example, ground bone upon one row of trees, muriate of potash or wood ashes upon another, nitrate of soda, if the land is poor, upon a third, and combinations of two and of all of these materials upon still other rows, with a proper number of untreated rows. If the plots have been properly selected, one should be able to tell at the end of the second or third year which of the elements are needed; and if the experiment has been carried on so as to have plots with different quantities of the fertilizers upon them, the amount that can be properly applied to each can be learned, and in this way one can be saved the useless application of fertilizing materials that are, perhaps, already in excess in the soil. As a rule, where no experiments of the kind have been conducted, a bearing orchard should have, once in two years, from 300 to 500 pounds of ground bone, 200 to 300 pounds of muriate of potash (instead of the muriate of potash, 100 bushels of wood ashes if unleached, or 300 bushels of leached, may be used); 150 pounds of nitrate of soda, or 25 tons of decomposed stable manure, will be beneficial if the soil is light. In addition to their value for supplying plant food, the chemical fertilizers have an additional value, that is perhaps equally important, as, by supplying soluble plant food early in the season, they enable trees to make their growth during the first of the season and ripen their wood thoroughly before winter. The growth is, as a rule, much more firm than that obtained by the use of stable manure, or from the natural fertility of the soil. In fact, the chemical manures can be used as correctives, since, if those containing potash and phosphoric acid are added to soils that have been highly enriched with stable manure, or that are naturally quite rich in organic matter, they will have a tendency to make the new wood more firm and compact. It can then be claimed that the proper use of chemical manures will increase the hardiness of the trees, and will both render the fruit buds less susceptible to sudden changes in the weather and lessen the danger of their winter-killing.

## THE NURSERY CULTURE OF THE PEACH.

While the farmer or village resident will prefer to purchase his peach trees of a nurseryman, it often happens that an extensive grower can, at a slight cost in labor, propagate his own trees and thus be more likely to secure the varieties he desires to plant, and to have them free from all taint of disease. There are no secrets in the nursery growing of peach trees that can not be readily acquired by any one, and, although practice in the various operations will necessarily make one more expert, if the instructions here given are carefully followed any intelligent person can grow peach trees.

## SOIL FOR A PEACH NURSERY.

Peaches need about the same kind of soil, whether in the nursery or in the orchard, although the nursery soil should be rather more fertile, and for propagating peach trees a well-drained, sandy loam should be chosen. A clover sod plowed under is an excellent preparation of the soil, and if the soil is naturally fairly fertile it will need no other dressing. If stable manure is used, care should be taken that it is not applied in excessive quantities, or in an undecomposed condition, as it would probably cause a watery growth that would not ripen, and winter-killing would ensue. If any fertilizer is needed, unleached wood ashes at the rate of 150 bushels per acre, and about 500 pounds of ground bone, will supply the necessary plant food, in anything but an exhausted soil, and a strong, well ripened growth can be obtained. If these are not used, and if the soil is deficient in organic matter, ten or fifteen loads of decomposed stable manure, spread broadcast and plowed in, will greatly aid in growing good stock. As stated above, a good clover sod plowed under will be preferable, as it will not only supply the necessary plant food to the soil but it will improve its physical condition. The land should be carefully fitted, as time expended in this will be doubly repaid by the amount saved in the after cultivation.

## THE SEED AND ITS PREPARATION.

As in the growing of all kinds of nursery trees, the first thing is to obtain suitable stocks upon which to work the improved varieties. As stock for this fruit, peach seedlings are almost universally used. The plum is preferred as a stock for the peach by the English, when they have a cold, wet soil, and is recommended by some for use under similar conditions in this country, but it is doubtful if there are any soils, or localities, in which peaches can be relied on to fruit, where the plum stock is necessary. Nearly all writers advocate the use of natural pits, or those from seedling peaches, and this is the almost universal custom. The claim is made that seedlings grown from natural seed are more vigorous than from seed of improved varieties. The natural seed owes its value to the fact that all the efforts of plants in a wild state are used in perpetuating themselves, while our cultivated varieties have been so modified by man in his endeavor to increase the amount, or the quality of the flesh surrounding the stone, that the reproductive properties in the seed itself are weakened, the seeds will be less certain to grow, and the trees will be

less vigorous, less hardy, and consequently shorter lived. At any rate, as nearly all of the natural seed comes from Virginia and Tennessee, where "yellows" is not known to be, there will be less danger of obtaining the germs of this disease in them, than when pits of improved varieties are used, unless one is familiar with the source from which the seed comes. The pits from canning factories that obtain their fruit from infected districts should be looked on with suspicion. The natural seed can readily be distinguished from that of the improved varieties, as it is smaller, more nearly spherical, and lacking the wing that is so noticeable around the edge of the latter; the canals upon the surface of the pits, also, are not so large nor deep as in the latter; the halves of the shell are more firmly united, and the kernels are firmer and thicker. The pits should, if possible, be obtained in the autumn, and although they may at once be planted in nursery rows, it is not the best plan, as the pits thus treated are not all of them sure to germinate the first year, if at all, and an uneven stand will result. It frequently happens that, when thus treated, part only of the pits sprout in the spring, others appear the following year, and still others may show themselves the third year from planting.

#### STRATIFYING THE SEED.

In order to secure the prompt germination of the pits, they should be so treated that they are exposed to the action of frost. If only a few are to be planted, they should be placed in thin layers, alternately with an inch or so of soil, in boxes, and after that closed up so that the moisture can not escape, and placed on the north side of a building where they will be out of the way of the drying influence of the sun. To secure the full action of frost, the seed should be soaked for twenty-four hours before being placed in the box, and it will be well to thus treat the seeds, however they may be stratified. When nurserymen stratify large quantities of seed, much the same course is pursued, except that they excavate a trench, ten inches deep and large enough to hold the seed, in some moist but well-drained soil. In this the seeds are placed in alternate layers of soil to a depth of eight inches and covered with two inches of sand. Unless the soil is moist it will be found well to wet the bed down thoroughly before covering it up. Another method is to spread out the seeds upon the surface to the depth of three inches, and then spade them in, taking pains to have them all covered. Treated in either way they will be exposed to the freezing and thawing of winter and the shells will be so loosened that as the seeds swell in the spring most of them will fall apart. When the time for planting comes they can be taken out, separated from the soil by means of a screen, and all that have not opened carefully cracked with the hammer. When an even stand is desired, and especially in localities where moles are troublesome, another method of stratifying will be found still more reliable. The pits are scattered on the surface in a single layer, forming a bed four feet wide and of the necessary length, and covered with two inches of soil. In the spring they will be so well cracked that most of them will sprout and send up shoots; as soon as they are three or four inches high they should be carefully taken out and transplanted with a dibble to the nursery rows at intervals of eight inches, placing them so that they will be about two inches deeper than they were in the seed-bed. By keeping the plants in pails of water, so that they

will not wilt, very few will be lost if the soil is moderately moist. If the season is very dry it may become necessary to water the plants once or twice.

#### PLANTING THE SEED.

In case the seed is planted in the fall, or in the spring before it has sprouted, the operation is not unlike the sowing of peas. Drills are made with a marker, or with a hoe if only a few are to be planted, two inches in depth and at intervals of about three feet eight inches, being rather more in rich soil and less in sand; in this the seeds, which have been previously cracked, are dropped about four inches apart. They should then be covered with a hoe or rake and the soil firmly pressed down, using a roller in light soil. From eight to ten bushels of natural seed will be required per acre, and with good success this should give twenty thousand trees; as a rule, however, not over ten thousand first-class trees will be obtained from an acre even under the best of conditions. In laying out the nursery, it is preferable to have the rows run north and south, and space should be left at each end to give room for turning in cultivating. During the first part of the season, the young seedlings should be cultivated once in ten days and the soil between the plants occasionally stirred with a hoe to keep the weeds down and a crust from forming. The cultivation should be shallow and with an implement with small teeth or shovels. About the first of August it will be well to go over them and rub off the leaves to a height of four or five inches on the stem. In case the season is dry, the cultivation should be more frequent, and if it looks, by the middle of July or the first of August as though the stocks would not reach a suitable size for working, they can be aided by scattering broadcast along the rows ground bone at the rate of three hundred pounds per acre and a bushel of wood ashes to eight or ten rods of row. Instead of the above, guano or superphosphate could be used. Nitrate of soda is also excellent to promote growth, but it should be used very carefully at the rate of not over 100 pounds per acre. These should be thoroughly worked into the soil. If conveniences for watering are handy it will pay, if the drought continues, to give the plants a thorough watering, which will help to render the fertilizer available.

By the last of August the smallest of the seedlings should be as large as a lead pencil and the others will range from that size to a half or five eighths of an inch in diameter.

#### BUDDING.

As the object of this operation is to obtain trees of certain desirable varieties, every precaution should be taken that the buds used are true to name. As a rule, they are more reliable if taken from bearing trees, but they are not as vigorous nor as easy to obtain as from nursery trees. If buds from small trees are used, especial pains should be taken, as a mistake with a single bud may make a difference with a hundred or more trees when buds are taken the following year. The buds, above all, should be healthy, plump, and well ripened; as a rule those at both the upper and the lower ends should be rejected. After cutting the bud-sticks, the leaves should at once be cut off, leaving the leaf stems about three eighths of an inch long, as handles to use in inserting the buds; to keep them from drying they should be wrapped in oiled cloth.

As a rule, the budding can be done as soon as the stocks are of a suit-

able size, and when the buds have become firm, but if the growth of the stocks is still very rapid it will be well to delay the operation, as a too vigorous growth may throw out or cover up and smother the buds. The budding should be completed ten days or two weeks before growth stops, and while it can be performed with good success as late as the first week in October, it is better to have it finished by the middle of September. If the budding is performed early in the season and the period of growth is long, the buds may start into growth and be injured by the winter. In addition to the seedling stocks and scions of the desired variety, the only materials required in budding are a budding-knife and something for binding the buds. The budding-knife (Fig. 5, *a*), has a thin, sharp blade with its end rounded so that the point is even with the back. To assist in opening the bark there is either a thin piece of ivory in the other end of the handle, or the tip of the blade may be rounded so as to make it blunt. As a wrapping material raffia, which is obtained in narrow strips from the epidermis of the leaves of a certain kind of palm, is most commonly used, although



FIG. 5.—BUDDING.

*a*, Budding-knife.*b*, Bud-stick and buds.*c*, Bud inserted and wrapped.

yarn or the bast layer of bark of the basswood are preferred by some. The operation of budding consists in making a T-shape cut in the bark of the stock and, after lifting the bark, placing under it a bud from the scion with a little bark attached and binding the bark firmly down upon it. The cut is made within three or four inches of the ground, drawing the knife either vertically or horizontally first, as is most convenient. In case the horizontal cut is first made, the knife should be drawn upward to the cross-cut, when making the vertical incision, and when the two meet a slight twist of the wrist will cause the knife to turn up the edges of the bark so that the bud can be easily inserted. If the horizontal cut is made last, it should be at a slight angle (Fig. 5, *a*) so that the corners of the bark will be somewhat raised from the stock. If the stocks are in proper condition for budding, the bark will be sufficiently raised to readily admit of the insertion of the bud. If for any reason the bark does not lift, the ivory at the end of the handle, or the rounded end of the blade of the budding-knife, can be used to open it. Having made the

stock ready for a bud, one of the bud-sticks (Fig. 5, *b*) should be drawn out from its wrapping and a bud (Fig. 5, *b*) removed. In cutting the bud, the scion is held in the left hand, resting on the forefinger, with the small end toward the body. The knife is inserted about half an inch below the bud and a cut is then made deep enough to take off a thin shaving of the wood and extending one half inch above the bud. The cut may be brought out through the bark at this point, entirely severing the bud, but this is likely to cause the bud to fall to the ground. The usual custom is to remove the knife and complete the severing of the bark, by a cut at right angles to the one first made. The shaving of wood taken off with the bark is removed by some budders, but it is not necessary and is sometimes harmful, unless carefully done, as the base of the bud may be torn out with the wood. Then take the stub of the leaf stalk, left for the purpose attached to the bud, between the thumb and forefinger of the right hand and insert it in the slit in the bark of the stock, crowding it down until the top of the bark attached to the bud is below the horizontal cut on the stock. If still loose, it is well to push it down until the bark of the stock presses firmly against the piece of bark attached to the bud. The bud is now ready for tying, which consists in wrapping a strip of raffia or other material that is to be used for the purpose, from twelve to fifteen inches in length, according to the size of the stocks, and from one fourth to one half inch in width, from two to four times around the stock beneath the bud, and about twice above it (Fig. 5, *c*), giving it tension enough to press the bark firmly down upon the bud. This pressure of the bark is beneficial in two ways, as by shutting out the air it prevents the bud from drying out, and by bringing the bud and stock in close contact the union is more rapid. The operation of budding is now completed but the tree is by no means ready for the orchard. In about ten days or two weeks the trees should be looked over, and if any of the buds have failed to take, new ones can be inserted. In all cases where the buds have taken, the bands should be cut, by drawing a knife across them on the opposite side of the stock from the bud. If one of the folds is cut it will be sufficient, as the wrapping will open of itself. Sometimes the growth of the stock before the bud has taken is so rapid that the pressure of the band will so check the flow of the sap that, if left to itself, the stock would be girdled. Upon all such stocks the bands should be loosened and retied. In case the budding is done toward the close of the season of growth, it is not always necessary that the bands be cut, as there is no danger of constriction and they will decay before spring, but under other conditions it is safer to be sure that the bands are cut. Nothing further is necessary the first year, unless the trees are on rather moist soil, where there is a good deal of freezing and thawing, in which case it is well to throw up a light furrow, on each side of the rows, covering the buds. In the spring this should be thrown away from the rows and the narrow strip between the trees drawn away with hoes. The stocks should then be cut back, the cut being made somewhat slanting, beginning on the side opposite the bud, about half an inch above the bud itself, and giving the top of the stub a slope of about 45 degrees. Sometimes the cut is made several inches above the bud and, later on, after the bud has sent up a stem twelve or fifteen inches high, the stub is cut back near enough the bud to admit its being readily grown over. Cultivation should begin as soon as the soil is in a suitable condition and should be kept up through the summer until the trees are large enough to shade the ground. In case the season is a

dry one, or if the trees make a slow growth, it should be kept up until the middle of August, using a fine-tooth, shallow-working implement. When growth starts, a number of suckers will start up from the stub of the stock. When they get to be two inches long they should be rubbed off, taking pains to remove every portion. As a rule, no others will come out, but if they make their appearance they should be promptly removed. The hoe should be used this season sufficiently often to keep the crust between the trees broken. The trees will be of a suitable size for orchard planting in the fall or following spring.

By the first of November, or earlier if most of the leaves have fallen, the trees can be dug. In doing this, pains should be taken not to cut the roots too short, as this would lessen the chances of living, and at best will shorten the growth the first year.

#### JUNE-BUDDED TREES.

In some sections, what are known as June-budded trees are grown, but they are of little value except as a means of rapidly propagating new sorts of which buds were not set in the fall. The scions must be cut in the fall, or winter, and kept dormant until the stocks have begun to grow so that the bark will lift. When the buds are set, most of the top is cut off, and in two or three weeks the stock is cut back to the bud, which soon breaks and forms a weak growth. In the south the method is used with fair success, but in this state it has few advantages and several disadvantages, the principal one, in addition to the weakness of the growth, being that it is likely to make a late growth and be injured by the winter.

#### THE CULTIVATION OF THE PLUM.

During the past ten years the plum has come rapidly to the front as a desirable fruit for the commercial grower. The success met with by the people of Oceana county in the cultivation of this fruit, and the highly remunerative prices obtained, have led to its being largely planted in various sections of the state, and the returns thus far obtained from the earlier plantings have been very generally satisfactory.

There are many sections of the state in which this fruit can be grown, where the peach will not thrive, and it will undoubtedly greatly increase in value as a commercial fruit.

While the care required by a plum orchard differs in some of its details from that needed by the peach, the general principles upon which we work are the same; we shall therefore treat the subject of plum-growing largely by referring the reader to the preceding pages upon peach culture, and merely pointing out the particular points in which the treatment given to the plum should differ.

#### SOIL AND CLIMATE FOR THE PLUM.

The climate of Michigan seems well suited to the plum, and it is a sure crop in all parts of the state except in some of the interior counties in the

extreme northern part of the lower peninsula and in portions of the upper peninsula, but even there the failure is due more to soil than climatic conditions. While the same general rules regarding elevation and exposure apply to this fruit as have been given for the peach, they vary in degree, and plums can, owing to the greater hardiness of the fruit-buds as well as of the trees, be grown in locations where the peach will fail. In fact, it is a common practice, when large areas are planted to these fruits upon rolling land, to use the higher portions for peach trees and to set the plums in the depressions, although if the soil is suitable the plums would do better upon the elevated land.

As a rule, it may be said that plums need a strong and rather heavy soil, but on the contrary the most successful plum orchards in the state are in Oceana county, where the soil is light. The soil there, however, is rich in lime and seems well adapted to the growth of the trees and to the production of large crops of fine fruit. For the best results, the land should be fairly moist, but success can not be obtained if it is not well drained. If moisture is present, with a proper supply of plant food, fair success can be obtained upon almost any soil, although a light sand, muck, or heavy clay should be avoided, with a moderately heavy loam, either sand or clay, as a choice.

#### AGE, SIZE, AND CARE OF TREES.

In a general way, the same rules apply here as were given for the peach. The ordinary planter will, however, find trees that have been grown in the nursery two years from the bud, preferable to one-year trees.

It may be well to state that plum trees are generally budded upon Myrobalan stocks, (another name for *Prunus cerasifera*, a dwarf European plum). The peach is sometimes used as a stock for American varieties, and is recommended by some nurserymen as a stock for European sorts on sandy soils. Sometimes St. Julien stocks are used, and others grown from cuttings of the Marianna (a Texas variety with close affinities to *Prunus cerasifera*) are meeting with favor. The first two kinds may be grown from imported seeds, but it is a more common plan to plant European-grown stocks. They are placed about three feet eight inches by six inches, and if strong may, under favorable conditions, be budded the same season. If not large enough, budding may be delayed until the following year. The season for budding the plum is earlier than for the peach, the operation being performed as a rule either the latter half of July or the first half of August. Other than noted, the care of plums in the nursery is the same as for the peach.

In heading back the top of the trees at the time of planting, the common practice differs somewhat from the method pursued with the peach. According to the amount of growth and the amount of root area, the branches are cut back from one half to two thirds, and the weaker ones are thinned out so as to leave not over five side shoots in addition to the leader, which should be shortened only about one third. The branches should be distributed upon the different sides of the stem as evenly as possible, taking pains also to secure a vertical distribution. Both extremes should be avoided in fixing the height for the head; three feet from the ground to the lower branches may be taken as an average, although many would have that as the maximum, and under some conditions it would be preferable to a greater height.

The after-pruning is confined to the thinning out of unnecessary branches, particularly those showing a tendency to rub against others, and the heading in of rampant shoots. The extremes of either heading in or thinning out, as practiced upon the peach, do not apply to the plum. A plum tree properly pruned at the time of transplanting will need but little training thereafter, and that given should be the least that will suffice to guide it into a symmetrical form.

As is the case with all other fruits, the plum needs thorough cultivation if we would obtain the best results. There is even greater need of fertilizers than with the peach, as the plum does not seem to be as good a scavenger as does that fruit, but if possible it should be in some mineral form. Stable manure can, however, be used under some circumstances to improve the physical conditions of the soil, its effect either upon a light or heavy soil being beneficial.

#### VARIETIES OF THE PLUM.

Nearly all the varieties commonly in cultivation belong to the so-called European species, *Prunus domestica*. The better kinds are as follows, arranged in the order of their ripening:

*Duane's Purple*.—Tree vigorous, shoots very downy, leaves large and downy. Fruit very large, oblong-oval, one side larger than the other. Stem slender, three fourths of an inch long, set in a narrow cavity; color red-purplish, red in the sun, dotted with yellow and with a lilac bloom; flesh light yellow, juicy, rather sweet; adheres slightly to the stone even when ripe. Ripens the middle of August. A profitable market sort.

*Washington* (Fig. 6).—Tree strong growing, forming a round head, leaves large and glossy, branches light brown, downy. Fruit quite large, roundish-oval, suture slight. Stalk five eighths of an inch long, stout, downy, set in a shallow but wide cavity. Deep yellow with crimson blush and dots, marbled with green before ripe. Flesh yellow, firm, sweet and rich, free. Last of August. One of the best yellow plums.

*Bradshaw* (Fig. 6) (*Niagara*).—Tree very vigorous, with large, purplish and smooth shoots. Fruit large, ovate, with a stout stem three fourths of an inch long, slightly inserted in the narrow cavity, sometimes with a slight neck; purplish red with a blue bloom. Flesh yellowish, becoming brownish yellow, rather coarse, but juicy and pleasant. Clings slightly to the stone until fully ripe. Last of August. One of the best of the standard varieties, although the new variety, *Field*, which in many respects resembles it, is preferred by many as it is one or two weeks earlier.

*Green Gage* (*Reine Claude*).—Trees small, slow growing, smooth shoots, buds with well-marked shoulders. Fruit small, with slight suture, round, green or yellowish green, mottled with red in the sun when fully ripe. Stem slender, one half inch long, slightly inserted. Flesh light green, rich, melting, juicy, luscious, free. The best in quality of all plums. Last of August and first of September.

*Lombard* (Fig. 6).—Tree vigorous with glossy, purple shoots, leaves crumpled. Fruit of medium size, oval, slightly flattened at the ends, suture indistinct, violet red, with thin, white bloom. Stalk slender, five eighths of an inch long. Flesh, deep yellow, juicy, pleasant, adhering to the stone. Early September. One of the most productive varieties. While it should be in every collection, the immense number of trees of this variety that have been planted within the past five years will tend, by lowering the

price, to make it less desirable for planting upon a large scale as a shipping variety.

*Jefferson*.—Fruit large, oval or slightly obovate, with faint suture, golden yellow with reddish blush, and thin white bloom. Stalk stout, one inch long, but slightly inserted. Flesh, deep yellow, juicy, melting, and of high flavor, free from long-pointed stone. One of the best dessert plums. First part of September.

*Prince Englebert* (Fig. 6).—Tree vigorous; branches smooth, downy. Fruit large, oblong-oval, deep purple, with brown dots and blue bloom. Stalk medium with a swelling at the base, set in a deep, narrow cavity. Flesh greenish yellow, juicy, sweet, and of good flavor, free. Early September.

*Gueñi* (Fig. 6).—Tree strong, vigorous, spreading, an early and abundant bearer. Branches stout, smooth, grayish brown. Fruit large, oval, slightly pointed at both ends, suture slight if any; dark purple with thick bloom. Stem long and slender, inserted in a deep, broad cavity. Flesh light yellow, rather coarse, firm, sweet when fully ripe, free. Middle of September. Excellent for shipping.

*Imperial Gage*.—Trees upright and fairly vigorous, shoots long and dark, downy. Fruit of medium size, oval with distinct suture. Stalk one inch long, moderately stout, set in a slight depression. Skin pale green, becoming yellowish with a distinct marbling of green stripes. Flesh greenish yellow, juicy, rich, and melting, generally free from oval-pointed stone. Quite productive. September. Excellent for both table and market.

*Pond* (Fig. 6) (*English*).—Tree very vigorous; branches grayish and smooth. Fruit large, oval, with distinct neck, reddish violet with a thin white bloom, and dotted with brown spots. Flesh yellow, rather coarse, but juicy and sweet. A very showy fruit, quite desirable for market. Middle of September.

*Quackenboss* (Fig. 6).—Tree, a strong, upright grower, shoots smooth. Fruit of large size, oblong-oval, deep purple in sun, with reddish spots, dark amber in the shade, stalk short, suture indistinct. Flesh yellow, rather coarse, sweet, and juicy. Quite productive and a valuable market sort. Middle of September.

*German Prune*.—Shoots smooth, slender. Fruit large, oval, swollen on one side, tapering particularly toward stem, suture well marked. Skin purple, with dense bloom. Stem slender, three fourths of an inch long, cavity shallow. Flesh greenish yellow, firm, sweet, free; stone flat, slightly curved. Used for preserving and drying. Middle to last of September.

*Damson* (Fig. 6).—Tree small, branches slender and thorny, subject to black-knot. Fruit small, oval, depressed, purple with a dense blue bloom, stem slender. Flesh melting and juicy, a partial cling, quite acid. September.

*Shropshire Damson*.—An English variety. Blue with a thin bloom, oblong or obovate, of rather better quality than the common Damson. Useful for preserves. Last of September, and October.

*Coe's Golden Drop*.—Tree moderately vigorous and quite productive, smooth. Fruit large, oval or obovate, with a slight neck, unequally divided by a well marked suture. Light yellow or greenish yellow with red dots on cheek. Stem seven eighths of an inch long, quite stiff. Flesh firm, yellowish, adheres to stone, juicy, sweet, excellent. Last of September, and October. Where it ripens it is one of the best late plums.

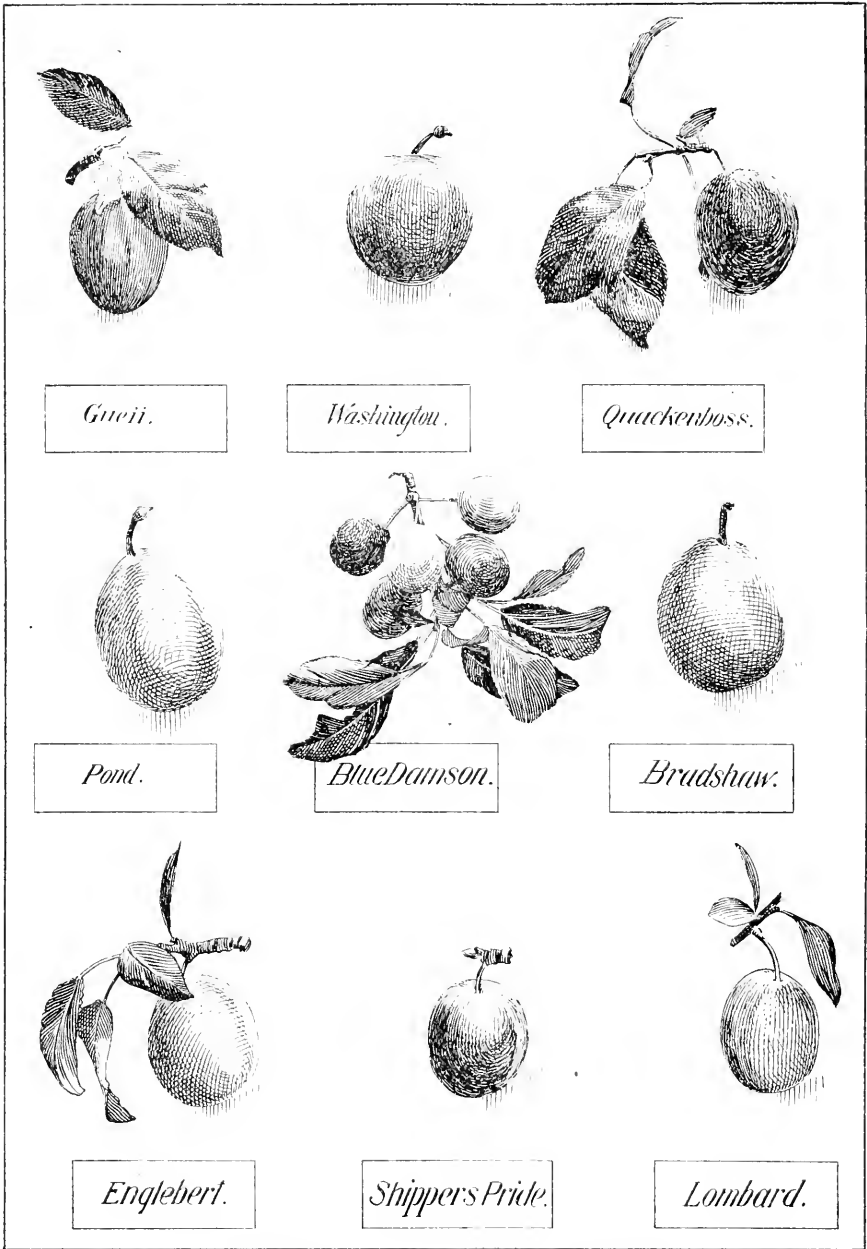


FIG. 6.—VARIETIES OF PLUM.—(One third natural size).

*Fellemburg (Italian Prune)*.—Tree slender. Fruit of medium size, oval, tapering to both ends. Dark purple with a dark bloom; stem in a shallow and narrow cavity, slender, one inch long. Flesh greenish yellow, sweet and juicy, and of good quality, free. First of October.

*Bavay (Reine Claudede Bavay)*.—Tree vigorous and productive, smooth; fruit large, round-oval, depressed, greenish yellow with red dots and pinkish green stripes; flesh juicy, yellow, sugary, of fine quality, nearly free. October. Desirable both for home use and market.

Of the comparatively new sorts that are meeting with favor where they have fruited are *Moore's Arctic*, naturally quite hardy, but the foliage drops badly and hence it often winter-kills. Tree vigorous, smooth, grayish-brown, and an early and abundant bearer. Fruit small to medium, round-oval, purplish-black with blue bloom. Stalk medium, slender, in a narrow cavity. Flesh greenish-yellow, rather coarse, juicy, sweet, pleasant, adheres slightly to stone. Seems to have little to recommend it, although it has been largely planted on account of its supposed hardness and earliness.

*Shipper's Pride* (Fig. 6).—Tree vigorous, quite hardy and productive. Fruit above medium in size, oblong-oval, deep purple with thick, blue bloom. Middle of September.

*French Damson*.—Tree more vigorous and a better grower than the other Damsons, hardy and very productive. Fruit of medium size, deep copper color with a rich bloom. Middle of October. Considered the best of the Damsons by Mr. Willard of New York.

*Peters' Yellow Gage*.—An old but little known plum. Trees fairly vigorous, with short, downy branches. Fruit medium to large, roundish-oval, light yellow, marbled with red in the sun, and with a thin bloom. Stalk large and stout, set in a wide cavity. Flesh yellowish, sweet, and juicy. One of the best of the yellow plums. Last of August.

*Stanton*.—Tree a good grower, fruit medium to large, round-oval; deep purple with a thick, bluish bloom. Quite productive. Last of September and early October. An excellent keeper and a promising late sort for canning purposes.

*Purple Egg (Hudson River)*.—Tree vigorous and quite productive. Fruit large, purplish-red with thin bloom. Flesh deep yellow, rather coarse. Last of September. A promising market sort.

Of the other new and promising sorts are Czar, Grand Duke, Murdy, Prince of Wales, Black Diamond, and Early Rivers (Rivers' Early Prolific).

*Simon (Prunus Simoni)*.—Tree small, upright, branches rough. Leaves are small, narrow, and glossy. Blossoms small, very early, and hence very likely to be injured by frost. Seems to be a productive sort in this state. Fruit of medium size, round, flattened, with a well marked basin at apex, firm. Color, reddish-purple with brown dots; flesh dull yellow, sweet, rather dry, slightly acid. Last of August. It seems to have no qualities that make it especially desirable.

#### AMERICAN PLUMS.

In the common works upon pomology little attention has been paid to any except the varieties of European origin (*Prunus domestica*). There are, however, a large number of varieties in cultivation that are derived from native species. While many of them are largely grown in sections of the south and west where the European varieties do not thrive,

they are of but little value in most parts of Michigan. Even when productive, they are generally small in size, with a tough skin and firm flesh, and many of them are of an acrid nature.

Until recently our cultivated native plums have been grouped into two species, the American or Canadian wild plum (*Prunus Americana*, Marshall) and the Chickasaw plum (*P. Chickasa*, Mich.) A few years ago they were carefully studied by Prof. Bailey of Cornell University, and a new classification made as follows:

Group A. The Americana Group (*Prunus Americana*, Marshall).—This species is found from New England to the Rocky mountains and extends from Manitoba to Texas. In the group are placed a number of hardy, strong-growing varieties "characterized by a firm, meaty, usually compressed, dull-colored, late fruit, with thick and usually very tough, glaucous skin, and large, more or less flattened stone which is often nearly or quite free, and by large, obovate, thick, veiny, jagged, dull leaves." "The fruits are somewhat flattened at the ends, and are commonly marked by a distinct suture. All of the varieties have a light purple bloom." Among the best varieties of this group are Cheney, De Soto, Forest Garden, Hawkeye, Louisa, Maquoketa, Purple and Yellow Yosemite, Rollingsstone, and Weaver. Wolf and Van Buren are classed as *Prunus Americana* var. *Mollis*, from the fact that they have pubescent shoots and foliage.

B. Wild Goose Group (*Prunus hortulana*, Bailey).—This embraces all varieties with a "wide-spreading growth and mostly smooth twigs, a firm, juicy, bright colored, thin skinned fruit which is never flattened, a clinging, turgid, comparatively small, rough stone, which is sometimes prolonged at the ends, but is never conspicuously wing-margined, and by comparatively thin and firm, shining, smooth, flat, more or less peach-like, ovate-lanceolate or ovate, long-pointed leaves which are mostly closely and obtusely glandular serrate, and the stalks of which are usually glandular." This species is found in the Mississippi valley from Illinois southward.

The species seems to be more closely allied to the Chickasaw than to the Americana group. "The fruits are usually covered with a thin bloom and are more or less marked by small spots. In color they range from a vivid crimson to pure golden yellow." On the other hand, the varieties of *P. Americana* seldom or never bear fruits of a pure yellow color, being more or less clouded and splashed with red. They are also generally thin-skinned and of a dull color. Prof. Bailey recognizes two types in this group, one of which is characterized "by thin and very smooth, peach-like leaves, which are very finely and evenly serrate" (Wild Goose), while the other is distinguished by "thicker, duller, and more veiny leaves, which are more coarsely and more or less irregularly serrate." (Moreman, Wayland and Golden Beauty.) The latter type seems to connect the plums of the Miner type quite closely with those of the Wild Goose group.

C. Miner Group (*P. hortulana*, var. *Mineri*).—It differs from the species "by the dull and comparatively thick leaves, which are conspicuously veiny below and irregularly, coarsely toothed and more or less obovate in outline, by a late, very firm fruit, and by a more or less smooth and Americana-like stone." Most of the varieties are quite hardy and are among the best of the native plums for southern Michigan. The best varieties are Clinton, Forest Rose, Miner, and Prairie Flower.

D. Chickasaw Group (*P. angustifolia*, Marshall), (*P. Chickasa*, Mich.).—The trees of this group have a slender, spreading, and irregular

growth, the trees are smaller and the leaves are small, lanceolate or oblong lanceolate, closely serrate, shining, and generally folded together or trough-like in appearance. The twigs are red and bear, on spurs upon the old wood, dense clusters of small flowers, quite early in the season. The fruit is small, generally red, and more or less spotted; the "flesh is soft, juicy, and more or less stringy and very tightly adherent to the small, broad, roughish stone." The small-leaved type of the Wild Goose group greatly resemble some of the varieties of the Chickasaw. Even in a cultivated state some of the varieties are quite thorny. Several of the Texas varieties are lacking in hardiness. Among the best of the Chickasaws are Newman, Pottawatamie and Robinson.

E. Marianna Group.—In this class were placed the Marianna and De Caradeuc, both of which have originated from the Myrobalan plums, the former as a hybrid with some native sort and the disseminator of the De Caradeuc whose name it bore believed it also to be of hybrid origin.

The DeCaradeuc is a valuable plum in some localities.

The Marianna was highly recommended as an early market plum when it was sent out, but its principal value is as a stock for other plums. It grows readily from cuttings and it has all of the good features of the Myrobalan and none of its bad ones when used for that purpose.

Many of the American varieties are incapable of fertilizing themselves. It has been particularly noticed with such well-known sorts as the Wild Goose and Miner, and from their failure to bear fruit the whole class has been condemned. When planted in alternate rows with some good pollenizers they will be found almost sure bearers. However, it must be stated that for nearly all sections of Michigan, the much more desirable European sorts can be grown to such perfection that there is but little occasion for the planting of American varieties.

#### JAPANESE PLUMS.

Within the last ten years quite a number of varieties have been brought into notice that have come from Japanese species. Most of them have been traced to *Prunus Mume*, either directly or as hybrids between that and some other species. One of the first of this class was the *Kelsey*, which is a large, fine plum in the south, but it is not sufficiently hardy for successful planting in Michigan. Under the name of Botan an extremely hardy race of plums has been introduced. It includes both red and yellow varieties and the much-lauded *Abundance* plum is sometimes, and properly, called Sweet Botan. It is quite hardy, very productive, and although the fruits are not large it is a quite desirable early plum.

The *Burbank* and other seedlings originated and sent out by Luther Burbank of California have been planted in portions of the state where the climate is tempered by lake Michigan, and they seem hardy there, but it is too soon to judge of their value, although they are very promising varieties.

The *Satsuma* is another variety of Japanese origin. It starts into growth very early and it is probable that it will be tender except in protected locations.

## INSECTS AND DISEASES OF THE PEACH AND PLUM.

The intelligent and skillful commercial grower of these fruits is blest by a large number of insect friends—*blest* and *friends*, because, if not for them, so many persons would engage in the business, and the crops would be so large, that the price at which they would sell would not pay for their cultivation. Under the present conditions, the number of growers is kept within bounds, and fair prices can be obtained, but even now the man who makes use of the remedies at his disposal in a rational manner will have large and perfect fruit, in years when his less intelligent or less industrious neighbor may have lost his entire crop, or will have inferior specimens that will be a drug in the market, even in a year of scarcity and of high prices. The fact that many of our insecticides and fungicides can be used in combination greatly simplifies and reduces the expense of preparation and application.

Every grower who expects to secure a crop of plums takes some means to destroy the curculio, and the day is not far distant when every successful peach- and plum-grower, to say nothing of the growers of other kinds of fruit, will make as free use of his spray pump for the application of insecticides and fungicides, as he now does of his curculio sheet. Their use is rapidly increasing, and last year the amount of copper sulphate sold in the state of Michigan for use in fungicides was not less than five tons.

In addition to the remedies given, too much stress can not be placed upon the importance of securing vigorous trees, by use of proper soil and a suitable location, an abundance of mineral fertilizers, and, above all, thorough cultivation. Clean cultivation not only aids the trees in their growth, but it breaks up the hiding places of insects. Untidy fence-rows are favorite breeding places for insects, and should not be tolerated. In the following pages will be found formulæ for some of the standard insecticides and fungicides, and descriptions and life histories of some of the more injurious *friends*.

## FUNGICIDES.

In Bulletins 59, 83, and 92, formulæ have been given for many of the more useful fungicides, but as they may not be at hand we repeat several that will be found valuable.

*Bordeaux Mixture*.—Slake two pounds of stone lime, and dissolve two pounds of copper sulphate in a wooden or earthen vessel, pour together and dilute so as to make from twenty to forty gallons as desired. Care should be taken to properly slake the lime, as injury to the foliage may otherwise result. A small amount of hot water may be used, or if cold water is employed it should be added only as fast as the lime will take it up. Air-slaked lime may be used, but the amount should be increased one half. To make sure that all of the free acid of the copper sulphate has been neutralized by the lime, after they have been poured together, and been thoroughly stirred, add a few drops of ferro-cyanide of potassium, and if it gives a brown color it indicates that more lime is needed, and it should be added until no effect can be produced by the ferro-cyanide. When that condition can be secured it shows that the free acid has been taken up, and that there will be no danger from using the mixture properly diluted upon any foliage. Of the various strengths for this mix-

ture there seems to be little difference in the effect, whether one pound of copper sulphate is used to ten gallons of water or for fifteen gallons, but if much more water is used the efficiency is reduced. For all applications before the leaves appear we prefer to use at the rate of two pounds of copper sulphate to twenty gallons of the mixture, and increase the amount of water by about five gallons for each subsequent application. If the first and second sprayings are made in a thorough manner at the proper times, *i. e.*, before the buds start, and just after the petals have fallen from the blossoms—a third application at from three to four weeks after the second will suffice unless it is desired to control the curculio by means of Paris green, in which case an intermediate spraying with that material alone, about two weeks after the second application of Bordeaux mixture, will be desirable, although, as the cost of the material is so small, it will be well to add the copper sulphate, the lime being necessary to prevent the burning of the foliage by the Paris green.

*Ammoniacal Carbonate of Copper.*—Dissolve three ounces of copper carbonate in 3 pints of ammonia water (26°) and dilute before using with 32 gallons of water. The original solution if kept in a glass stoppered bottle will retain its strength for a long time.

This mixture seems rather less effective than the Bordeaux mixture in the destruction of fungi and is more likely to injure the foliage; in fact, it is hardly safe to use it upon the peach, particularly as it is only applied in midsummer, when it is not desirable to use lime upon the ripening fruits. So far as the spotting and poisoning of the fruit with the preparation are concerned, there is but little danger, although it is not advised to spray fruits with it that are to be gathered within three weeks.

As sold upon the market, copper carbonate costs from 30 to 50 cents per pound, but it can be made for less than half those prices. To make it, dissolve one pound of copper sulphate and one pound of carbonate of soda. Pour together and, in the precipitate that forms, there will be the equivalent of eight ounces of copper carbonate. Turn the water off and either allow the precipitate to dry, or use at once as desired. The modified *eau celeste* is practically the same as the ammoniacal carbonate of copper, made as above, except that it contains more copper carbonate and it is rather more effective.

#### INSECTICIDES.

In order to make an efficient use of insecticides one must not only understand the methods in which they act, but he should have at least some general information regarding the habits of the insects to be treated. Many of the failures reported are due to lack of this knowledge, since a remedy may be used that is unsuited to the purpose, as a little knowledge would have shown. Not only are remedies for sucking insects used upon leaf-eating forms and *vice versa*, but many persons seem to have an idea that spraying will prevent all injuries to their fruit, and, without giving thought to the proper remedy, expect to destroy insects by the use of fungicides, or the reverse.

*Arsenites.*—For all leaf-eating insects some form of poison should be used, when it can be placed so that they will obtain it. The more common remedies are Paris green (arsenite of copper) and London purple (arsenite of lime). White arsenic and corrosive sublimate are used by

some persons, but while less expensive are rather more dangerous to have around.

Paris green is rather more efficient than London purple, and being less soluble is not so likely to injure the foliage. When purchased in large quantities the cost is little if any more, and if to be used in combination with Bordeaux mixture, as is generally desirable, it is preferable to London purple, as the Paris green itself is quite a valuable fungicide. When used alone, however, the water must be kept continually in agitation to prevent it from settling, and as there is less danger of this with London purple it has the preference under those conditions.

Neither of these arsenites can be used alone in a proper strength upon the peach, except very early in the spring, without danger of burning the foliage. They can, however be added to Bordeaux mixture at the rate of one pound of arsenite to 250 gallons of the mixture, and the lime will serve to neutralize any free acid. If it becomes necessary to use them independent of the Bordeaux, they can be rendered innocuous if one pound of lime is added for each pound of the arsenite. Combined in this way, it can be used even upon the peach, as strong as one pound of London purple, or Paris green to 200 gallons of water.

*Kerosene Emulsion.*—This is the best known specific for such insects as obtain their food by sucking it through a tube-like proboscis, although it is fatal to nearly all insects with whose bodies it is brought in contact. It can be readily prepared by heating one quart of soft soap until it becomes liquid, then remove from near the fire and add one pint of kerosene. With a force pump violently agitate the mixture for from three to five minutes until it becomes homogeneous and cream-like throughout. Stirring should not be relied upon, and even when the pump is employed there will be danger from its use if, on standing, the oil collects upon the surface. Every precaution should be taken to secure a perfect and stable emulsion for which rapid work is necessary, which should be kept up until a foamy mass is secured. Before using, add six quarts of water, so that the kerosene will be about one sixteenth part of the mass. If soft soap is not at hand, from two to four ounces of hard soap may be used instead. Dissolve it in a quart of hot, soft water, and after bringing it the boiling point, remove from the fire, add the kerosene, and proceed as before. Even more care will be necessary in securing a stable emulsion than when soft soap without water was used.

It should be remembered that, to be effectual, this remedy must be brought in contact with the bodies of the insects, and as the leaves oftentimes act as a shield, it will need to be applied with considerable force through a fine nozzle in order to produce a mist-like spray.

*Carbolic Acid.*—The use of this substance about plum and peach trees seems to prevent the curculio and other insects from depositing eggs. The usual way of applying it is as carbolate of lime, or as "carbolyzed plaster." A half pint of crude carbolic acid is mixed with about fifty pounds, either of air-slaked lime, or with land plaster (gypsum), and thrown over the trees while the dew is on, about the time the blossoms have fallen. It should be repeated twice at intervals of ten days, or oftener if washed off by rains.

Carbolic acid can also be used to advantage, combined with kerosene emulsion, for washing the trunks of peach, plum, and other fruit trees, for the destruction of insects; one pint will answer for ten gallons.

*Other Remedies.*—For the destruction of aphides, scale, and simi-

lar insects, there are several effective remedies, although none of them equal kerosene emulsion. Strong soap-suds will be found a simple and quite effective remedy, and tobacco tea is even more reliable. This can be made by soaking tobacco stems in hot water. For some purposes pyrethrum, or buhack, will be of value. This can be applied as a powder with a bellows, or in water at the rate of a teaspoonful to the gallon.

#### LEAF-EATING INSECTS.

Under this heading we may include any forms that injure the foliage by biting and chewing the foliage. The plum has something like forty insects that have been known to feed upon it, and there are at least ten that have been found injuring the foliage of the peach. None of them, however, are particularly troublesome, as it is only in rare instances that they become sufficiently numerous to be injurious. When their presence is discovered, it will be a very simple thing to destroy them by the use of Paris green, and as a safeguard we would always recommend the addition of a small quantity, say two ounces to forty gallons, whenever Bordeaux mixture is applied during the growing season, and at the present time the extent of the injury caused by fungous diseases is such that the application of this fungicide should not be neglected.

The cherry slug (*Eriocampa cerasi*) sometimes appears upon the plum, but can be controlled by the arsenites.

#### SNOWY TREE CRICKET.—(*Oecanthus niveus*, Serv.)

The branches of the plum and peach are often punctured by this insect and eggs are deposited in the punctures. They select the young growth of the trees and make their punctures in long lines one above the other, until from thirty to fifty eggs have been deposited; sometimes a half dozen or more groups of punctures are made upon a single branch. The injured tissues become dry and the branch is much weakened, although, if in a vigorous, growing condition, the injury soon becomes covered up. Some of the punctured branches can be cut away, but in recently set trees it is generally impossible to cut all of them out without removing too many of the shoots.

The eggs hatch in the early summer and the mature insects are rather beneficial than otherwise, as they feed upon plant lice. In the fall they deposit eggs, and if they are so numerous as to need a remedy, this is the best time. As soon as they are found to be at work, the trees should be sprayed with kerosene emulsion to which one pint of crude carbolic acid has been added for fifteen gallons of the emulsion. It must be confessed that this is not an ideal remedy, as, while the kerosene will kill all the insects it touches, its effects are not lasting, the carbolic acid merely tending to keep the insects from depositing eggs in the trees sprayed, and driving them to other plants. The raspberry, currant and grape, are also injured by the snowy cricket.

#### PLUM CURCULIO.—(*Conotrachelus nenuphar*, Herbst.)

The fruit of the plum, peach, and cherry, as well as the apple and pear, are often much injured by the larvæ of this pest, so much so that unless precautions are taken it is almost impossible to secure a crop. The plum

and peach are so injured that they drop from the trees, while the presence of the worms in ripe cherries not only ruins those containing them, but renders the others objects of suspicion.

The perfect insect is a grayish-black beetle about one sixth of an inch long, with a hump upon each wing cover and a short curved snout, which is turned back beneath the thorax when not in use.

The insects appear about the time the trees blossom (sometimes a few days before), and, as soon as the fruits form, deposit one or more eggs in each. With the snout a small hole is made, upon the side of the fruit, and a cavity is excavated just under the edge of the skin, in which an egg is deposited. To cause the growth of this part of the fruit to stop and thus to prevent the egg from being crushed, the beetle makes a crescent-shaped cut (thus *c*) around the egg. In this mark we have an infallible sign of the work of this insect. Ovipositing continues for about ten days, from five to ten being deposited daily.

The eggs generally hatch in from four to seven days, the larvæ being small, white grubs. They feed upon the flesh and quickly eat in to the stone, around which they feed. They reach full size in from three to five weeks,

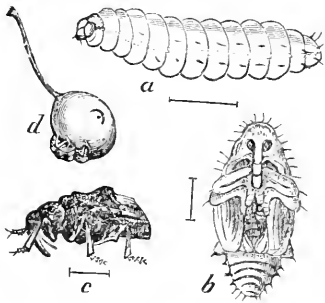


FIG. 7.—PLUM CURCULIO.

a larva. b pupa. cadalt. d plum stung.

and the fruits are often so injured that they fall to the ground before this time. When full grown, the larvæ emerge from the fruit and enter the ground to the depth of five inches, where they change to pupæ, and at the end of from four to six weeks become fully developed beetles. In this form they pass the winter hidden under the rough bark, or other similar protection, and come out in the spring ready for work. The mature beetles, contrary to former belief, feed upon the foliage, and bark, and even eat holes in the young fruits merely for the purpose of obtaining food. From the life history as

given above, various preventive remedies are self-evident. It will always be well to have all fruit as it falls eaten by hogs or sheep, while poultry are quite useful in a plum orchard. In thinning the fruit those removed can readily be dropped into baskets and then burned. Frequent cultivation at the time the insects are entering the ground will destroy many of them, and fall plowing will also be beneficial. If the trunks of the trees are washed in the early spring with kerosene emulsion we shall both kill many curculio, as well as other insects, and deprive them of a hiding place under the bark, as the growth will be less likely to crack. As a rule, however, this will not suffice, and other remedies must be resorted to. The most effectual is the shaking or jarring of the trees at the time the insects are depositing their eggs. While the curculio may fly from tree to tree during the day, in the early morning they are not active, and if disturbed they generally fall upon their backs and "play possum." By jarring the trees at this time they are thrown down and can be caught upon sheets. A screen is made from eight to twelve feet square by tacking cotton cloth upon a light frame-work, with an opening in one side large enough to admit the body of the trees, or two narrow frames may be used, one upon each side of the trees. Another form of screen is often made by tacking strips of wood to two opposite sides of a square of cloth

of suitable size, which is open to the center from one end to admit the tree. Sometimes a screen is mounted upon a wheel-barrow. The trees are jarred by bumping them with a maul padded with rubber to prevent injury to the bark. To admit of giving heavy blows to large trees, some of the branches are cut off leaving stubs to pound against, or pieces of half-inch gas pipe or large nails may be set in the trees for this purpose. The frequency and number of jarrings will depend upon the abundance of the curculio, varying from daily to three or four days apart and continuing for from one to three weeks. The insects should be collected upon the screen and placed in a pan with a little kerosene in the bottom.

While the jarring is the surest way of fighting this insect, the use of arsenites will generally be effectual in saving enough for a crop if they have been kept in check in previous years.

With a good setting of fruit and a comparatively small number of insects, a good crop will be insured by spraying, and where the treatment is kept up from year to year little or no harm is done by the curculio, even when no jarring has been done. While spraying is sure enough to be recommended as above, especially if Bordeaux mixture is also used, we advise all to watch their trees, and if the curculio are present in numbers to jar and thus make sure of them.

The first spraying should be made as soon as the blossoms fall, and will need to be repeated about twice, at intervals of ten days. If rains intervene, three or four applications at shorter intervals should be made.

By combining arsenites with Bordeaux mixture we shall also have a remedy for the various fungous diseases of these fruits, and will both render impossible the burning of the foliage and make it more efficacious as an insecticide, as the lime will tend to hold it for a longer time upon the foliage, and will also in part prevent the deposition of the eggs.

The use of carbolized lime also will be found of value, when the arsenites are not employed, or a similar result, *i. e.*, the driving of the insects away from the trees, can be secured by the addition of about one pint of crude carbohc acid to twenty gallons of Bordeaux mixture.

#### THE PLUM GOUGER. (*Coccotorus prunicida*.)

The gouger in some respects resembles the curculio, but it differs in being of a grayish-brown color with frequent white and black spots upon its back; its legs and thorax are of a dull yellow color. In size it is something over one fourth of an inch long, and its snout is stout, projecting to the front, so that it can not be doubled back under the body. The eggs are placed in pits that the insect bores in the fruit of the plum nearly as deep as its snout is long. The pits are enlarged at the bottom and the snout is used in pushing the eggs to the lower end. The larva, upon hatching, eats its way into the seed and feeds upon its kernel. It pupates within the stone, and then emerges as a perfect beetle in September. The gouger is seldom very injurious, but the same remedies answer for it as for the curculio, whenever it does appear.

#### THE ROSE CHAFER—(*Macrodactylus subspinosus*).

The rose chafer, rose beetle, or rose bug, as it is variously called, is frequently quite injurious from its eating the flowers, young fruits, and leaves of the peach and plum, as well as the grape, apple, and other fruits, and various flowers.

It proves ironclad against the arsenites and kerosene emulsion, and the only effectual remedy is hand-picking in the cool of the day. The use of carbolic acid as recommended for the plum curculio seems to be distasteful to the beetles and tends to drive them away. Clean cultivation undoubtedly tends to destroy them to some extent, as they pupate in the soil.

#### THE APHIDES OF PEACHES AND PLUMS.

Both fruits are often injured by plant-lice. The foliage of the plum is attacked by the so-called plum-tree aphid (*Aphis prunifolia*, Fitch), while the peach tree aphid (*Myzus persicae*, Sulzer) attacks the leaves and twigs of the peach, and the black peach aphid (*Aphis persicae-niger*, Smith) attacks roots, leaves, and tender shoots.

The plum tree aphid, when first hatched, is of a greenish-white color, but it soon grows darker, and later in the season becomes nearly black. Like other plant lice, these insects obtain their food by sucking the juice from the leaves and young shoots. This tends to weaken the plants and the leaves become more or less blistered, and finally roll up. If the attack is severe they may drop from the trees.

The eggs are deposited upon the branches, at the base of the buds, or in cracks in the bark, in the fall. The insects are hatched about the time the buds open in the spring. The first brood consists entirely of females, which develop in ten or twelve days, after which, for some three weeks, they give birth to about two young aphides daily, and then they die. This is repeated by the successive broods until cold weather approaches, when both males and females are produced. After pairing, the females deposit eggs as noted above.

These insects obtain their food by sucking the juice of plants through their long, slender beaks. It will be seen that they can not be destroyed by the use of arsenites, and some remedy must be employed that will kill by contact.

For the aphides upon our fruit trees we have no better remedy than kerosene emulsion, although tobacco water, soap suds, and pyrethrum in water are valuable.

The peach-tree aphid works in about the same way as does the plum aphid, and the same remedies should be employed. Like the plum aphid, some of the females and also the males are winged, to permit them to seek fresh pastures after one has been fully occupied. The winged females are nearly black in color and about an eighth of an inch in length, while the wingless individuals are of a yellowish-red color. The males are yellow with brown markings.

The black peach aphid has been very destructive in the eastern states, where it is found in large numbers upon the branches in the spring, often killing outright small trees and the younger branches of the older ones; they have destroyed entire orchards in some localities and are particularly troublesome to the young trees in nursery rows. They are dark brown or black in color, and have unusually large beaks.

As noted above, this aphid also feeds upon the roots of the trees, and upon sandy soil it is particularly destructive. Dr. E. F. Smith, who first discovered its workings, attributes to it many so-called cases of yellows. The trees made a weak growth, the leaves were yellow and shrivelled, but none of the distinctive features of yellows were present. The fact that this insect has an underground existence favors its development, as it is out of

the reach of ordinary remedies. They are most likely to appear upon trees growing in exhausted soil, hence we should ward off their attack by supplying proper food. If they appear, the use of several pounds of common salt, kainit, or muriate of potash to the tree will destroy the subterranean form. All of the above species are destroyed by the common "lady-birds." These, as mature insects, are about three eighths of an inch in length and nearly as wide. They are beetles and somewhat resemble a small Colorado potato beetle except in color, which in this insect is generally yellow or red, or some intermediate shade, with from one to fifteen, generally round, spots upon the wing covers. The larvæ of this insect and of the lace-wing and syrphus flies are also quite destructive. They should be recognized as friends, and not treated as enemies.

#### THE PLUM-TREE BORER. (*Aegeria pictipes*.)

The trunk and branches of plum trees are often considerably injured by the larvæ of this insect, which gnaw the inner bark and new wood of the trees. The flat-headed apple-tree borer and the peach-tree borer are also sometimes found in the plum tree. An idea of the life history of these insects and the remedies for them can be obtained from the following lines regarding the peach-tree borer.

#### THE PEACH-TREE BORER.—(*Sannina exitiosa*.)

This is one of the most destructive insects that the peach-grower has to contend with, as, unless its attacks are guarded against, the very life of the trees is menaced. The borers are hatched from eggs that are deposited upon the trunk by moths that have a general resemblance to wasps, and at first sight are often mistaken for them. The male has transparent wings with a spread of about seven eighths of an inch. It has a slender, bluish-colored body with yellowish markings. The female has a wing spread of fully one and one fourth inches, the front pair being opaque and of a glossy, blue color, the same as the body, while the hind pair are transparent with dark margins. The body of the female is cylindrical and considerably larger than that of the male. As a rule, the eggs are deposited close to the ground, but are sometimes placed higher up on the trunk. They soon hatch, and the larvæ eat their way through the bark and generally work their way toward the roots. The sap, together with the castings, extrudes and forms a gummy mass at the surface of the ground. The full-grown larvæ measure about three fourths of an inch in length, and are of a yellowish-white color with black jaws and a yellow head. The larvæ remain at rest during the winter, but in the spring, after completing their growth, they form cocoons at, or just beneath, the surface of the soil and close to the root of the tree. After three or four weeks, the perfect moths appear, generally during July or August, and soon deposit eggs of other broods. The presence of the borers can readily be detected by the gummy exudation and steps should at once be taken to remove them. The tree should be examined in the autumn and again in the spring, and all borers dug out with a sharp-pointed knife. In order to find them readily, the soil should be drawn away from around the trees, but it must be replaced lest the trees be injured during the winter. Under all conditions, the destruction of the larvæ should not be neglected, and as a rule it will be sufficient; but, in localities where they are very troublesome, it is well to apply some kind of wash to the trunks of the trees about the first of July, to prevent the

deposition of the eggs. One of the best washes is made by thinning down soft soap until it is of the consistency of thick paint and adding a tablespoonful of crude carbolic acid to each gallon of wash. Paris green and lime are also added by some people. The wrapping of thick paper, or of fine, wire netting, about the tree trunks will also keep the insects from depositing their eggs.

#### MICE AND RABBITS.

In orchards where the trees are growing in sod, or where there is litter of any kind about the trees, mice sometimes girdle them, and rabbits are frequently quite troublesome. In the first case, a remedy will be found by removing the conditions that favor the mice, which are also of themselves injurious to the trees. If this can not be done, a mound of soil free from litter placed around the trees to a height of one foot will save them from the mice. Mice, and to some extent rabbits, can be fenced out by wrapping the trees in the fall with paper or netting. Another remedy is to paint the tree trunks in the fall with a lime or cement wash, to every ten quarts of which a heaping tablespoonful of Paris green has been added. The smearing of the tree trunks with blood is claimed by some to keep away rabbits.

#### PEACH YELLOWS.

Of all plant diseases none is to be more dreaded than the one that for the want of a better name is known as "yellows" of the peach. The character of the soil, its location, and the variety of the peach seem to have no effect upon its appearance, and whenever it manifests itself the best thing to do is to immediately dig out and burn the trees. Nothing is positively known of the nature of the disease, but as it is undoubtedly contagious it is probably caused by some low form of vegetable parasite allied to the bacteria. The disease has been studied by many persons, both chemically and microscopically, and for six years the Department of Agriculture has had an expert who has given his entire attention to studying and experimenting with diseased trees; every means has been afforded him, but, although much valuable knowledge has been acquired regarding the disease, nothing has been learned of its real nature. The disease has been at various times ascribed to the effect of soil exhaustion, of borers, of cold, of root aphides, of eel worms (*Anguillule*), of wet subsoil, neglect of cultivation or of pruning, the excessive use of nitrogenous manures, or the use of pits or buds from diseased trees. If trees are propagated from either pits or buds of diseased trees, yellows will undoubtedly appear, but experiments by Dr. Erwin F. Smith, the expert mentioned above, and others, seem to show conclusively that the other conditions will not of themselves cause yellows to appear in the peach, although they may induce an appearance that to the inexperienced eye may resemble that disease. It is also very probable that trees weakened by any of the above adverse conditions may be particularly susceptible to it.

#### HISTORY OF YELLOWS.

Although we have no definite information regarding the time and place of the appearance of yellows, it is quite certain that the disease has been known for at least one hundred years in the neighborhood of Philadelphia, and from that point it gradually spread in all directions, appearing in New York in 1801 and in Massachusetts in 1818. Within recent years it

has exterminated the peach orchards of Maryland and northern Delaware, and is gradually spreading southward. It appeared in Berrien Co., Michigan, in 1866, the germs being presumably brought in nursery stock from New Jersey. For a few years it spread very slowly, but after 1875 it became very destructive and showed itself in nearly every orchard in the county. In 1874 there were fully 650,000 peach trees in Berrien county, and in 1877 the shipments were more than a half million baskets, but such was the virulence of the disease that after 1875 few orchards were planted, as young trees were carried off within two or three years. The attack was so severe and so widespread that the number of trees in the county fell to 50,000 in 1884, and in the townships of Benton and St. Joseph, where it first appeared, hardly a tree remained. It worked northward and appeared at South Haven in 1869 and at Paw Paw about 1877. The disease was not particularly destructive at South Haven until 1875, but from that year until 1880 it increased in virulence. The fruitgrowers of South Haven, profiting by the experience of their neighbors at the south, waged a war of extermination and, where it was followed up, the loss was quite small. In some cases the proper precautions were not taken and entire orchards were destroyed. The history of the disease is about the same in Allegan, Kent, and Ottawa counties, where it appeared later. While it has undoubtedly appeared in other counties it has done little harm. It behooves the peach-growers in all parts of the state to be on the watch and on its first appearance to stamp it out. With our present lack of knowledge of the real cause of yellows, we can do no more than to subject the trees to such conditions as will be most likely to keep them healthy. We should, then, use trees free from taint of disease; plant upon high, well-drained soil; avoid the use of excessive quantities of nitrogenous manures, supplying necessary plant food for the most part in the form of chemical fertilizers; give frequent, regular cultivation; cut back and thin out the trees to secure a strong growth; remove all surplus fruit while still small and thus prevent it from drawing needlessly upon the trees; fight early and late against the borers and other insects, the curl-leaf, rot, and other fungous diseases. This treatment should give us strong, vigorous trees that will be more likely to escape the attack of yellows than those grown under opposite conditions would be. While it is believed that favorable conditions for the growth of the trees will render them less susceptible to this and all other diseases, it is not claimed that the trees will have entire immunity, and it is not likely that a case of yellows can be cured if it once appears in a tree; but if yellows makes its appearance in an orchard where some of the conditions are unfavorable, it is probable that, if the diseased trees are at once removed and the remaining trees are given proper care, they will be less liable to attack than if nothing had been done except to remove the diseased trees. From the fact that we have no definite information, as has been previously stated, regarding the exact nature of the disease, the above can not positively be stated to be correct, but from our general knowledge of plant physiology, and the fact that plants as well as animals that are in a healthy condition and with congenial surroundings are less subject to disease, than those that are weak and exposed to unfavorable conditions, it will be well for the practical fruitgrower at least to hold to this belief until it has positively been demonstrated to be false. The course recommended is the one that will be most likely to give profitable returns, and if in any way it aids in warding off the disease it will be so much gained, while if it fails to do this there will be no loss.

## TREATMENT FOR YELLOWS.

If the disease makes its appearance, there is but one thing to be done, and everyone now advises that the tree be at once dug out and burned. It will probably be best to dig around the tree and take out the trunk and the larger roots to a distance of perhaps two feet from the stem, although some growers top off the branches and later on cut out the stump. The removal should take place immediately after a tree is found to be diseased, and all growers should familiarize themselves with the appearance of the disease in its first stage, that it may be taken in hand in time.

## APPEARANCE OF YELLOWS.

While by some persons the term "yellows" is applied to almost any unhealthy condition of the trees that gives them a yellowish appearance, the true "yellows" as known to peach-growers is a specific disease with certain well-defined symptoms by which it can be recognized.

While it may be somewhat modified by local conditions, it almost invariably passes through certain changes and runs a definite fixed course. Yellows first manifests itself in a tree, in the premature ripening of the fruit. In a healthy tree each variety has a somewhat definite time of maturity, but, if the tree is attacked by this disease, the fruits may color up two or three weeks before those on the neighboring trees of the same variety are ripe. The time of ripening, however, is variable, as sometimes the difference is only a few days but in other cases it may be four or five weeks. Not only do they ripen prematurely, but the fruits upon diseased trees is quite different in appearance from that on healthy ones. Besides being much higher colored than healthy peaches, the surface is more or less blotched with dark red dots, giving the fruit a speckled appearance (Fig. 8, 1). As a rule, the blotches are small and show quite distinctly against a lighter background, but sometimes they are so numerous as to run together and give the face, or perhaps the entire surface of the peach, a purplish appearance. A still more distinctive feature is that the discoloration is not confined to the epidermis, but extends into the center of the fruit so that upon being cut open the flesh has a mottled appearance, the coloring being in the form of streaks, dots, and splashes; around the pit the coloring is unusually dark, and sometimes in light-colored varieties the entire flesh is of a uniform red color. As a rule, the flesh of premature peaches has but little flavor, although in some cases it is slightly bitter. The fitness for food of premature peaches depends upon the extent to which they are affected, as, if the attack is but slight, they are palatable, but in the advanced condition they are not fit for food. The safest plan is to destroy all affected fruit. The disease may not appear upon all parts of the trees the first season, but if a single peach ripens prematurely and has a spotted flesh, it is an infallible indication that the tree has yellows in its incipient stage, and there should be no delay in destroying it and its fruit.

We give here a description of the illustrations on the next page: in Fig. 8, 1 represents a peach attacked by yellows. 2. A healthy peach for comparison. 3. Specimen taken in the autumn, showing how the tree has put out leaves and blossoms from the winter buds. The spring foliage has already fallen. 6. Represents a similar specimen. 4. Shows the tufted spring growth due to yellows. 5. A branch taken in the autumn; the spring foliage has nearly all fallen, and autumn leaves have developed from winter buds. 7. A healthy peach branch for comparison.

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(The illustration was kindly loaned by the publisher of the American Cultivator, Boston, Mass.)



FIG. 2. PEACH YELLOWS.

2.

1.

## SECOND STAGE OF YELLOWS.

Following the appearance of the disease in the fruit, it shows itself by the development of small, wiry twigs (Fig. 8, 4), commonly spoken of as a fungous growth. While these frequently do not appear until after the tree has given a crop of premature fruit, a tree showing the twigs will always bear diseased fruit. As a rule, if only a small portion of the fruits are premature, the wiry, starved growth will not show until the following season, although they may appear in the autumn on the trees that were healthy the previous year. These shoots grow in clusters (Fig. 8, 4) upon any part of the tree, but generally are most numerous upon the main branches and near the forks. Sometimes they are straight and unbranched, but, as a rule, especially late in the season, they are branched, the buds in the axils of the leaves making a premature growth the same season they are formed. The shoots are often short-jointed and form thick tufts. The leaves are small, being about half as long and wide as healthy ones, and have a yellowish tinge. The buds are small and generally winter-kill, as the shoots do not mature their growth.

Another way that it appears, is when apparently healthy trees send out in the autumn the small shoots distinctive of yellows, with the pale yellowish-green foliage. The trees show the same symptoms the second year as were noticed the first, and in addition the fruit, if any is borne, is small, both in size and quantity, bitter in taste, or at least of inferior flavor. All of the tree is now generally involved, and the foliage is quite yellowish and even red in color and considerably curled, particularly on the shoots sent out in the spring. Sometimes the tree dies the second year, but it is usually the third, or perhaps the fourth year that it finally succumbs. The diseased shoots are quite brittle and seem to have little life. There are no well-authenticated cases of recovery from this disease. After a tree affected with yellows has been removed, it is a common practice to set a young tree in its place, and no harm has been noticed from replanting the spring following the removal of the diseased tree. In case the affected tree was left long enough to transmit its contagion to the neighboring trees, there would undoubtedly be danger of the newly planted tree becoming in time infected by its diseased neighbors, but at any rate the young tree would be less likely to be attacked than other trees in the orchard. In practice, with prompt removal of diseased trees, there seems to be no danger in replanting the next year, and peach orchards of recent years have suffered but little from yellows, when steps were taken to promptly eradicate the disease as soon as it appeared. This indicates that, up to the time of its outward manifestation, the disease is not readily transmitted.

## YELLOWS FROM DISEASED PITS AND BUDS.

While there can be no question that the disease can be communicated to nursery stock by the use of pits or the buds from diseased trees, we believe there is less danger of introducing yellows into a locality in this way than by means of nursery trees grown in the vicinity of diseased orchards, or where the trees themselves were from healthy stocks but were infected by neighboring nursery trees which may have acquired the disease either through the pit or bud. In the experiments of Dr. Smith, less than one pit in a thousand, from premature peaches, grew, but there may

be some danger of the disease manifesting itself in trees grown from pits produced by portions of trees that as yet show no signs of yellows, but that will exhibit signs of yellows the following year. In most cases, however, the nursery trees from such pits will show signs of yellows the first year and will hardly fail to escape the second, so that on purchasing them the fruitgrower will be able to detect the disease before the trees are planted.

It is nearly seventy years since it was claimed that yellows could be spread by the buds, and it is quite certain that if buds are taken from a tree in the second stage of the disease few of them will start at all, and those that do will make but a feeble, unhealthy growth. When from trees that are just coming down with the disease, *i. e.*, when if in bearing a few of the fruits will be premature, the disease may not appear to any extent in the nursery, and an unscrupulous nurseryman will sell the trees that do not show it, in this way scattering the disease. The only safe way is to purchase trees in localities where yellows either has not appeared or is in check, and where one has good evidence that the pits have come from uninfected regions, and the buds are from healthy trees. If any of these precautions are neglected there is great danger of obtaining the germs of the disease. Many growers claim that if, in carrying a diseased tree from the orchard, a branch rubs against a healthy tree, it will convey the disease, and while this may not be true, it is very probable, and prudence would seem to dictate that the tree be cut up and burned upon the spot, or, if carried to a brush pile outside, it should be removed with great care not to bring any part of the tree into contact with a healthy one. As soon as possible the trees should be burned. In localities where the disease prevails, if the affected trees are promptly destroyed the loss seldom exceeds three per cent., while if this is neglected it spreads with increasing virulence until every tree may be destroyed. From the contagious nature of the disease, it can be seen that it can not be guarded against unless there is concerted action in the infected districts; and to secure this the state of Michigan has enacted what is known as the "Yellows Law," which reads as follows:

#### THE YELLOWS AND BLACK-KNOT LAW.

AN ACT to prevent the spread of the contagious diseases known as yellows and black-knot among peach, plum, cherry, prune, almond, apricot, and nectarine trees, or the fruit thereof, by providing measures for the eradication of the same, and to repeal act number one hundred and fifty-eight of the public acts of eighteen hundred and ninety-one, entitled "An act to prevent the spread of yellows, a contagious disease, among peach, almond, apricot, and nectarine trees, and to provide measures for the eradication of the same, and to repeal act thirty-two of the session laws of eighteen hundred and seventy-nine," approved April four, eighteen hundred seventy-nine.

SECTION 1. *The People of the State of Michigan enact*, That it shall be unlawful for any person to keep any peach, almond, apricot, plum, prune, cherry or nectarine tree, infected with the contagious disease known as yellows or black-knot, or to offer for sale or shipment, or to sell, or to ship any of the fruit thereof, except the fruit of the plum and cherry tree; that both tree and fruit so infected shall be subject to destruction as public nuisances as hereinafter provided. No damages shall be awarded in any court in the state for entering upon the premises and destroying such diseased trees, or parts of trees or fruit, if done in accordance with the provisions of this act.

It shall be the duty of every person, as soon as he becomes aware of the existence of such disease in any tree, parts of trees or fruit owned by him, to forthwith destroy, or cause said trees or fruit to be destroyed.

SEC. 2. In any township, city or village in this state in which such contagious diseases exists, or in which there is good reason to believe they exist, or danger may be justly apprehended of their introduction, it shall be the duty of the township or village board, or city council, as soon as such information becomes known to either such board or council, or any member thereof, to appoint forthwith three competent freeholders of said township, village, or city, as commissioners, who shall hold office during the pleasure of said board, village or city council, and such order of appointment and of revocation shall be entered at large upon the township, village, or city records: *Provided*, That the commissioners now appointed and in office shall continue in said office until their successors are appointed and qualified.

SEC. 3. It shall be the duty of said commissioners, within ten days after appointment as aforesaid, to file their acceptances of the same with the clerk of said township, village or city, and said clerk shall be *ex officio* clerk of said board of commissioners, and he shall keep a correct record of the proceedings of said board in a book to be provided for the purpose, and shall file and preserve all papers pertaining to the duties and actions of said commissioners, or either of them, which shall be a part of the records of said township, village, or city.

SEC. 4. It shall be the duty of the commissioners, or any one of them, upon or without complaint, whenever it comes to their notice that either of the diseases known as yellows or black-knot, or other contagious diseases, exist, or are supposed to exist within the limits of their township, village, or city, to proceed without delay to examine the tree or fruit supposed to be infected, and if the disease is found to exist, a distinguishing mark shall be placed upon the diseased trees and the owner notified personally, or by a written notice left at his usual place of residence, or if the owner be a non-resident, by leaving the notice with the person in charge of the trees or fruit, or the person in whose possession said trees or fruit may be. The notice shall contain a simple statement of the facts as found to exist, with an order to effectually uproot and destroy, by fire, or as the commissioner shall order, the tree so marked and designated, or such parts thereof, within ten days, Sundays excepted, from the date of the service of the notice; and in [cases] case of trees known as nursery stock, or fruit so infected, such notice shall require the person in whose possession or control it is found to immediately destroy the same, or cause it to be done; said notice and order to be signed by the full board of commissioners.

SEC. 5. Whenever any person shall refuse or neglect to comply with the order to remove and destroy the tree or parts of trees so designated and marked by the commissioner as aforesaid, it shall become the duty of the commissioner to cause said trees or parts of trees to be removed and destroyed forthwith, employing all necessary aid for that purpose. The expenses for such removal and destruction of trees or parts of trees, to be a charge against the township, village or city; and for the purpose of such removal and destruction, the said commissioners, their agents and workmen, shall have the right and power to enter upon any and all premises within their township, village or city.

SEC. 6. If any owner neglects to uproot and destroy or cause to be removed and destroyed as aforesaid, such diseased tree, or parts of trees or fruit, after such examination and notification, and within the time hereinbefore specified, such person shall be deemed guilty of a misdemeanor, and punished by a fine not exceeding one hundred dollars, or by imprisonment in the county jail not exceeding three months, or both in the discretion of the court; and any justice of the peace of the township or city where such trees may be, or where such nursery stock or fruit is sold, shipped, disposed of, or delivered as aforesaid, shall have jurisdiction thereof. The words "parts of trees," wherever used in this act, shall refer to the black-knot only, and not to trees affected with yellows.

SEC. 7. The commissioners shall be allowed for services under this act two dollars for each full day, and one dollar for each half day, and their other charges and disbursements hereunder, to be audited, as well as any other charges and disbursements under this act, by the township board, village or city council, all of which costs, charges, expenses, and disbursements may be recovered by the township, village or city from the owner of said diseased fruit or nursery stock or from the owner of the premises on which said diseased trees stood, in action of assumpsit.

SEC. 8. All of act number one hundred and fifty-eight of the public acts of eighteen hundred and ninety-one, be and the same is hereby repealed.

This act is ordered to take immediate effect.

Approved May 25, 1893.

It will be seen that the fruitgrowers of any section have it in their power to secure the prompt destruction of all fruit and trees in which the disease appears. In Berrien, Van Buren, and Allegan counties there are numberless cases where the disease has been kept in check, even after it has appeared in an orchard, and one can also find in those same counties other instances in which the law has not been enforced, where yellows appeared in fully 30 per cent. of the trees in 1893, and even then nothing was done beyond cutting off the branches and leaving them on the ground to scatter their contagion, while the trunks of the trees left standing sprouted and sent up wiry shoots that show unmistakable signs of yellows. If the owners alone are to be the sufferers, after all that has been said and written on the subject, one would hardly waste a thought upon it, but one can not help feeling sorry for the neighbors whose orchards seem doomed to destruction, even though they have not shown public spirit enough (to say nothing of their private interests) to secure the enforcement of the law. As will be noticed, the law also provides for the destruction of the "black knots," upon plum trees, which is a disease fully as fatal as peach yellows, where its appearance is not guarded against. With a little concerted effort, however, this disease also can be readily controlled.

BLACK KNOT. (*Plowrightia morbosa*. Sacc.)

In some parts of the state entire plum orchards have been destroyed by this disease, and there is great danger of its obtaining a strong foothold in the plum-growing districts and crippling that thriving industry. The only hope of safety is in the thorough awakening of every plum-grower to the danger that menaces him. If they could see the thousands of acres of plum orchards that have been blotted out by this disease in the state of New York, during the last five years, they might be upon their guard.

In order to successfully combat this disease, all the plum-growers in a given locality must be leagued in an intelligent warfare against it. If one man allows the knots to form upon his trees he will spread the disease to his neighbor's orchards. As much of the danger comes from the dispersion of the spores, formed by the knots before they have taken on the black, pimply appearance (Fig. 9, 1) that is usually regarded as distinctive, every one should be familiar with the changes through which the knots pass. The spores (seeds) are borne through the air and, falling upon the branch of a plum tree, soon germinate and penetrate the tissues. They grow there until the following spring without manifesting their presence. A swelling will then be seen at the point infected, generally two or three inches long; the bark cracks and the branch seems to puff out to twice its normal size. If these incipient knots are cut off and burned at this time, the injury to the tree will be stopped and, what is of most importance, it will be destroyed before it has had time to ripen and scatter its spores. In one or two months, if left upon the tree, the knot becomes covered with an olive-green mold, made up of an immense number of spores upon their supporting stalks; these are soon scattered by the wind and disseminate the disease. In the autumn, a hard, black crust forms over the knot; this is covered with minute pimples in which a second form of spores is produced. They ripen late in the winter and are the source of other knots. Hundreds of knots often appear upon a single tree, and as they not only rob the tree of food, but practically strangle and starve the branches upon which they are located, by girdling them and thus shutting off the supply of food, the tree is soon destroyed.

One source of contagion is through nursery stock, and young orchards should be carefully watched, when trees are obtained from infected districts. Not only is there danger from knots upon other plum trees, but it seems probable that the knots upon the cultivated cherries, choke and other wild cherries, and wild American and other wild plums, may be of the same species and be able to communicate the disease to plum trees in our orchards. Experiments by inoculation would seem to indicate that the knots upon choke cherries will communicate the disease to cultivated plums, and the only thing that points to the contrary is that the plum orchards in Oceana county are sometimes surrounded by thickets of the wild pin cherry (*Prunus Pennsylvanica* L.), and yet remain free from disease. However, as these thickets of wild plums and cherries are at best a nuisance, prudence would indicate the desirability of applying the ax and fire to them, as there may be conditions under which the disease may be transmitted. It has been noticed that there are unknown conditions under which the disease has greatly increased virulence. For several years it may make but little headway, but at length a time will come when it will sweep like fire through the plum orchards and entirely blot them out.

The disease is certainly getting a strong foothold in some sections, and it behooves every plum-grower, even if he has but a single tree, to be upon the alert.

It is now nearly five years since the writer began a crusade against the disease, and, from the reports that come in, it is encouraging to see that the growers appreciate the danger that menaces them, and are acquiring the knowledge of its appearance necessary to enable them to combat it upon its manifestation. What is needed now is a united public sentiment against it that will secure prompt action upon the part of all.

While the destruction of the outside sources of contagion should not be neglected, it seems desirous that the trees should be kept in such a condition as will enable them to withstand the disease; hence, thorough cultivation and liberal quantities of mineral manure should be given the orchards. As severe outbreaks of the disease often follow years of full crops of fruit, it

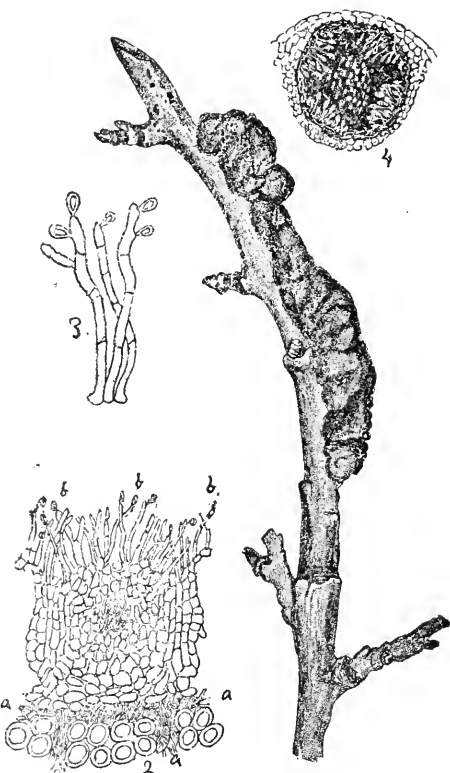


FIG. 9. BLACK KNOT. *Ploerightia morbosa*. Sacc.  
1. Stem of plum tree with knot upon it, as it appears in the fall and winter.  
2. Perithecium with mycelium, a a between the cells of stem, and covered with filaments bearing spores. b, at their extremities. Section made in May.  
3. Filaments and spores (conidia), more highly magnified.  
4. Section through a cavity containing stylospores. After Farlow.

will be a wise precaution to prevent overcropping, and the consequent weakening of the trees, by a judicious thinning of the fruit.

As indicated above, whenever a knot appears it should be cut off, while still but partly developed, *and destroyed by fire*. The cut should be made several inches below the lowest point where any discoloration can be seen in the wood, in order to remove all of the tissues of the fungus and prevent its spread down the branches. If the knot is upon the trunk of the tree, while it might be economy to remove and burn the entire top of the tree, if not the tree itself, it can generally be prevented from spreading if the swelling is carefully pared away and the wound treated with tincture of iodine, which seems to have the power of destroying the tissues of the fungus without injuring the tree. The wound should then be covered with linseed oil paint. Good results have been found from the use of the oil alone but the treatment with iodine seems more efficient.

Cut off or treat the knots whenever they are found, but careful examinations of the trees should be made in the spring and again in the fall to prevent the knots that may have escaped attention during the summer from developing spores.

To secure proper attention to the destruction of the knots, a law was enacted by the last legislature, as a part of the yellows law (which is given in this Bulletin under that heading). The intelligent and wide-awake fruit-grower does not need to be compelled to destroy his knots, by legislative enactment, but he should avail himself of its aid in securing the destruction of the knots upon the trees of his criminally careless neighbor.

#### PLUM BLADDERS. (*Eroascus pruni*. Fuckl.)

The fruits of the European plums and both branches and fruit of American sorts are often attacked by a fungus causing them to swell up. The fruits in particular are greatly distended, the contents are destroyed, and only a hollow shell remains, hence the name. The diseased twigs and fruits should be removed and burned. While entire immunity may not be secured by spraying, as for the rot and shot-hole fungus, with the Bordeaux mixture, there are no other known remedies.

#### THE PEACH AND PLUM ROT. (*Monilia fructigena*. Pers.)

Particularly in wet seasons this disease has caused frequent losses to the peach-and plum-growers, the entire crops in some cases being destroyed. The apricot and cherry also are subject to the same disease. It is most injurious to the early sorts, but few if any varieties are proof against it. In the case of the cherry, and plum, the foliage as well as the fruit is attacked and the young twigs, particularly of American varieties, may also be involved. Not only does the presence of moisture seem necessary for the germination of the spores, but the spread of this disease is in proportion to the humidity of the season. The appearance of the disease is familiar to all, but it may not be generally understood that the patches of yellowish-brown dust seen upon the surface are the spores or seeds of the disease, by which it is disseminated. When two or more fruits grow so closely together that they touch, the sides in contact are generally covered with moisture, and the germination of the spores is hastened; it is a matter of general observation that if one fruit is attacked the rot always spreads to all fruits that touch it. By the proper thinning of the fruit, the rot is made less destruc-

tive. From the fact that the early varieties of the peach seem most subject to the disease, many growers have given them up entirely. In seasons when damp, muggy weather prevails, it is doubtful if the rot can be entirely kept in check by fungicides, but under fairly favorable conditions there will be little if any loss from this disease, if Bordeaux mixture is used as directed for the treatment of the peach-curl, and of course there will be no additional expense. When we consider the loss that often occurs from even one of these diseases, it should induce every fruitgrower to make use of this simple and cheap remedy.

In case the month of July is wet and lowery, there will be danger that the early applications of Bordeaux mixture may not be sufficient to hold the rot in check, while in case of the plum, the shot-hole fungus may need treatment. For late varieties that will not be harvested for six or eight weeks, the Bordeaux mixture may again be used, but for the August sorts it will be better to use the ammoniacal solution of copper carbonate, although this should not be used within three weeks of the time the fruit is to be gathered.

PEACH-LEAF CURL. (*Eriosus deformans*. Berk.)

This disease, which is known to be of a fungus nature, is in wet, cold seasons very destructive to the foliage of peach trees, often causing all of the older leaves to drop from the tree, and the result is that much of the fruit also falls. The tissues of the affected leaves become thick and later on are blistered and distorted. At first they are of a light olive color but, later on, as the spores develop, they are covered with a whitish powder. It was at first thought that as the conditions that favored the appearance of the disease (wet, cold weather) were so unsuited to success in the application of fungicides, that at best they would prove only partially satisfactory, but although the past season was so wet during May and June that in some parts of the state the disease was quite troublesome, the results were unexpectedly favorable. At the college little curl appeared, but along the lake shore many growers were considerably troubled and where tested the fungicides were of value in keeping the disease in subjection.

When in attendance at the summer meeting of the State Horticultural society at Shelby it was my pleasure in company with others to visit many of the neighboring peach and plum orchards. The curl was quite prevalent, but where the trees were sprayed a marked difference was noticed. In the extensive orchard of A. Adams about one half of the trees received a single application of Bordeaux mixture after the disease appeared, but at the time of our visit (June 15) the effect was very noticeable, as the loss of foliage and fruit was far less upon the sprayed trees. At our South Haven sub-station, as will be seen by the accompanying report of Prest. Lyon, the curl was almost completely held in check, although fully half of the leaves had fallen from unsprayed trees in the neighborhood.

With such a cheap and effective remedy at hand, this disease need not be especially feared. To secure the best results the trees should be thoroughly sprayed with Bordeaux mixture in the spring before the leaves start, the application should be repeated within a week after the petals have fallen, and a third application should be made in about three weeks. If very rainy, a more frequent use of the fungicide may be necessary, and an

additional application can often be used with profit, as, even if the curl is not particularly troublesome, the treatment will be found effective against the rot of the peach, which in wet seasons is so destructive, and by the addition of Paris green the ravages of the curculio will be lessened.

SHOT-HOLE FUNGUS—(*Septoria pruni*.)

The disease to which this very distinctive name has been given has, during the past two years, caused the death of thousands of plum trees in the state of Michigan, and yet, had proper precautions been taken, they could have been saved at a cost of not over three cents per tree.

The leaves of plum trees during July and August are often found pierced with a number of holes about the size of a pinhead, the tissue which filled them having been destroyed by the above fungus, and the dead structure then dropped out.

In severe cases, the injury to the foliage is so great that all of the leaves upon the trees, except a few at the tips of the branches, drop off, generally before the middle of August. A tree thus denuded of its leaves is in poor condition to ripen its growth and prepare for winter, and not only are the watery, unripened branches injured, but the entire tree is often killed to the ground. If the ravages of the fungus can be checked, the foliage will be able to perform its functions, and the trees will in most cases survive the winter without injury.

As a rule, if the trees have been treated with Bordeaux mixture, as recommended for the plum rot, there will be but little injury from the disease. It will be well to spray young trees, that are not yet in bearing, about the middle of July and again early in August, and the spread of the disease can be almost entirely prevented.

PLUM AND PEACH SCAB.—(*Cladosporium carpophilum*.)

This fungus is in some seasons quite injurious to the fruits of both of these trees, and it also attacks the leaves and tender shoots of the peach.

At the time the fruits begin to color, small greenish spots appear; as these spread the centers take on a brown and even a black appearance. When the spots are numerous they unite and may cover the entire surface of the fruits. The De Soto plum and Russian apricots seem particularly subject to this disease; in 1893 the crop was practically ruined by it. Its workings were not noticed until too late to test the efficacy of fungicides. Prof. Pammel reports the disease upon the increase in Iowa, and it may become generally troublesome.

BROWN SPOT (*Helminthosporium carpophilum*.)

In September, 1893, a basket of seedling peaches in a peddler's wagon was noticed to be badly spotted with some fungus, that although it had some slight resemblance to *Cladosporium*, was manifestly distinct from it. Superficial examination failed to reveal any specific spores, and specimens were sent to Prof. Galloway of the Division of Vegetable Pathology at Washington, for identification. He was not familiar with it, however, and was not able to make out any distinctive spores. Dr. Beal had, however, independently obtained specimens of the disease, and after long and careful search found the spores and was able to identify it as the above disease. The fungus seems to be quite superficial in its workings and the fruits

were not noticeably distorted. Many of the fruits were badly spotted and in some cases nearly covered with yellowish brown scabs. From the fact that the disease was not more widely known it evidently has not been very destructive, but if it becomes distributed it may become quite injurious to our peach crop.

#### GATHERING AND MARKETING.

Even if a good crop is grown, success is not assured until it has been gathered and put upon the market, in fact, success or failure will often depend upon the ability with which this is done.

From the fact that both of the fruits under discussion are of a decidedly perishable nature, great care must be taken to gather them at such a period that they will be still in good condition when placed upon the market.

With the peach, for such markets as are likely to be supplied, the fruit should be gathered just as it is reaching a ripe condition, a period which can better be shown than described. The green color should be just disappearing from the under side of the fruit, giving way to a yellowish-white or flesh color, as the case might be. As an indication to the touch, the flesh of the upper side should give slightly, when pressed with the ball of the thumb. The latter sign is not infallible, but the former seldom ever fails. With a little experience, a man can judge of the condition of a peach without employing either method except occasionally as a test. Under no circumstances should the thumb nail be used to test the fruits, and every precaution should be taken not to bruise them. Taking a fruit lightly and yet firmly, between the thumb and fingers a slight twist of the hand will serve to separate it from its stem. The rule of "handling as if they are eggs" will not apply with peaches, since they need even greater care.

#### PACKAGES FOR PEACHES.

The packages best adapted for the shipping of peaches depend, first, upon the wants of the market and, second, upon the grade of fruit and the distance it is to be transported.

For a local market it is generally best to use either peck or fifth-bushel baskets for the best quality of fruit, and the bushel or half-bushel size for seconds. Much the same rule holds good when shipments are made by rail or boat. It is best, however, to study well the wants of a market and to use the size and style of package that is most in favor with the middlemen and the consumers, as, however it may be in other things, it will not pay to attempt to educate the taste of the public in the style or size of package to be used. With the packing, however, it is different, and an endeavor should be made to put up the fruit in such a way that it can be transported without unnecessary bruising, and at the same time be attractive to the eye. The packing, however, should be honest, and all the peaches should be of the grade indicated by the top layer.

Regarding the use of the fifth-bushel and other sizes of packages that were brought out as "snides," it should be said that in some markets they are recognized as standard sizes and are sold on their merits. If the middlemen prefer to handle that size, and if the consumers desire it, the producer should by all means supply the demand, as, if the fruit is shipped in pecks, the jobber or retailer will quite likely repack it. The price being by

the basket, he will be a gainer to the extent of twenty-five per cent., which really belongs to the producer. On the other hand, where the best trade recognizes the peck basket only as a legitimate size, it will be very unwise to ship in fifths, as the shipments from parties who use peck baskets will receive first attention, while those in fifths, which are here regarded as "snides," are sold for what they will bring.

No arbitrary rule can be given for the grading of peaches, but for an appreciative trade the number of grades should be two, if not three. On the other hand, in some markets and with some dealers, as much can be obtained when fruit is packed without being assorted, as when graded and put up in the most careful manner.

For the average market, after rejecting all decayed and badly injured fruits, two grades are all that it will be desirable to make. The method of grading will depend something upon the market, but, in a general way, the first grade should contain only large, well-colored peaches that are perfect in form and free from blemishes. All other marketable specimens should go into the second grade; the distinctive line between the second-grade peaches and those that are to be rejected will depend upon the market and the abundance of the crop.

If a person can secure a reputation for the grading and perfect packing of his first-class peaches, his brand will secure him an advance of from ten to twenty-five cents per basket above his neighbors, who may have shipped just as good peaches, but for all that the dealer or purchaser may know, unless he inspects every package before buying, he has stuffed with "culls" and the price given will be sufficiently low to insure against loss. The grower who desires to work up a reputation and thus obtain this extra price should carefully brand his packages, showing, in addition to his name and address, the grade of peaches contained in the package and a guarantee that the packing is honest. If he does this, and lives up to his representations, he may be sure of an advance over the market price, and in the case of a glut, when his neighbor may not get enough from his shipment to pay charges, he will be sure of a sale at a fairly remunerative price. Many growers do not place their names upon the packages in which the "seconds" are shipped, although the same guarantee of honest packing would have fully as good an effect with them, as with the first-class fruit, in securing its full value and a ready sale when the glut comes. Even if the packages do not have the name of the shipper upon them, they should bear a private mark that would be recognized by the commission merchant or retailer, and enable him to guarantee the honest packing of the baskets.

The growers in the "peach belt" are as fast as possible releasing themselves from the grasp of the South Water street, Chicago, commission men, and are so far as possible seeking out markets for themselves. The shipments are generally made by express to consumers and retailers in country towns and small cities in non-peach-growing districts, and if well managed a desirable trade can be built up. For shipping in this way the first-class peaches only are used.

The so-called wagon trade is of considerable importance. This consists in the sales made to men who have driven, oftentimes, fifty or seventy-five miles, from points in Indiana or Illinois, perhaps, for the purpose of buying ten to forty bushels of peaches. They peddle them out on their way home, reserving enough for the use of themselves and their neighbors.

One should have some ready communication with his market. The growers in most sections of the "peach belt" can ship either by water to

Chicago or Milwaukee, or by rail to all points. In this way they secure competition in rates, gentler handling of their shipments, and more courteous treatment, when favors are requested or complaints made. In localities where one or more cars can be loaded in a day, very low transportation rates and prompt service can be secured, either by fast freight or by express. The thing most needed by the grower is a low express rate to small interior points on small lots.

For the purpose of securing market for the fruits and by coöperation obtaining the highest market prices, the so-called "Shippers' Exchanges" or similar organizations have been found very successful in some states, but although they have been formed at various shipping points in Michigan, through no fault of their own, they have not proved as successful as they should. Fairly successful in securing low rates of transportation, they have failed in raising the price obtained for fruit by guaranteeing the packing, through the selfishness of parties who persisted in using "snide" packages and stuffing them at that.

#### PICKING AND MARKETING THE PLUM.

The general rules given for the peach apply also to the harvesting and packing of the plum, but need to be slightly modified in some of their details.

The plum, for any except local markets, will need to be picked slightly before it is ripe, this depending upon the length of time necessary for transportation.

The color, firmness, attachment to the branch, and the taste, are all employed in determining the fitness of a variety for market; but, with the differences that exist in the long list of commercial sorts, no infallible description will be attempted as a guide for picking. A little practice will soon teach one the proper conditions.

In handling the plum, the same care is needed as for the peach, and particular attention should be paid to the preservation of the bloom. The usual packages for plums are the fifth or peck baskets or the ten-pound Climax basket. The style, however, changes from year to year and differs with the market.

AGRICULTURAL COLLEGE, }  
*January 25, 1894.* }

## A YEAR AMONG FRUITS.

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Bulletin No. 104.—Horticultural Department.

It is now five years since arrangements were made for a fruit testing sub-station at South Haven, in the midst of the great commercial fruit interests of the state, and the fifth annual report of the superintendent, Hon. T. T. Lyon, is appended. The fifteen acres at our disposal are closely planted with the leading tree and vine fruits hardy in this latitude. In making the selection an attempt has been made to secure all of the promising new varieties that are brought out, if possible, in advance of their introduction. As the first planting was done in 1888, with large additions in 1889, 1890, and down to 1893, many of the large fruits are as yet not in bearing, but an idea of the amount of work that has been done can be obtained from the report.

Under the skillful and painstaking care of Prest. Lyon, the plantation has been in splendid condition, and is well worthy of a visit from any one interested in pomology. All such will always find a welcome.

Attention is called to the following points in the bulletin:

*First*, The elaborate notes upon the varieties under test, as they give the unbiased opinion of one of the most experienced pomologists in the country, they are certainly worthy of careful study. The lists of peaches and grapes contain quite a number of Michigan seedlings that should be watched with interest.

*Second*, The methods used in combating the insects and diseases. Although the treatment was rather more thorough than would be used by commercial fruitgrowers (or than will be necessary a second year, so well are they in hand), the results have been so beneficial in the freedom of both foliage and fruit from their attack that all expense has been well repaid. In previous years, the injury from raspberry anthracnose, currant

and gooseberry mildew, strawberry leaf-blight, peach curl and rot, plum rot and shot-hole fungus, pear and quince leaf-blight, and from various insects, has been quite severe, but the treatment given has sufficed to keep the trees and plants in almost perfect health.

It has for some years been known that the Bordeaux mixture and other copper compounds were reliable remedies for many fungous diseases, but although our previous experience upon a small scale had led us to believe them of value for strawberry leaf-blight, raspberry anthracnose, and peach leaf-curl, the experiments at South Haven the past year have fully convinced us that they should be freely used upon these plants whenever the diseases are troublesome. As is well known, certain varieties of strawberry are much injured by leaf-blight, but where they were properly sprayed the plants were practically free from the disease. The same thing was true of peach curl and of raspberry anthracnose.

Elaborate experiments were carried out upon several varieties of grape, to ascertain the number of applications, and the time of making them, desirable in combating the various diseases to which they are subject. The black rot did not show itself, and there was but slight injury from other fungi. Attention is called to the results upon the Brighton, which was considerably troubled with powdery mildew. As the number of applications increased from none to five, the health of the plants improved in the same degree. Much of the benefit derived from the fungicides was undoubtedly due to the fact that all of the plants were sprayed before the growth started.

L. R. TAFT,  
*Horticulturist.*

*To Professor L. R. Taft, Horticulturist:*

SIR—In submitting my report of operations for the season of 1893, at the South Haven fruit testing sub-experiment station, it seems convenient to consider the several classes of fruits in the order of their maturing.

The preceding season (1892) proved to be specially favorable for the development of the various species of fungi, the ravages of which proved more than usually injurious. The entire plantation was given a spraying during the late autumn, after the foliage had fallen, and prior to the advent of freezing weather, for the purpose of destroying the winter or resting spores, and thus, at least to some extent, preventing their development the following season.

The apparent effect of such fall spraying, as well as of spray applied during the present season, will be noticed in connection with each class of

fruits in its order, as will also the depredations of insects and the remedies applied.

STRAWBERRIES—(*Fragaria*).

The plat of which the following is a record was planted in the spring of 1892. The stand of each variety, when full, consisted of twenty-six plants, of which one half were kept in hills, by the removal of all runners, while the remaining half were allowed to form a matted row.

Very soon after the planting had been completed, a series of almost continuous rains commenced; the showers followed each other in such rapid succession that the soil remained saturated for a considerable period, while the recently set plants were gaining a hold upon the soil.

The enfeeblement consequent upon this trying condition, occurring at so critical a juncture, proved so serious that, followed as it was by drouth in late summer and early autumn, many, if not most, varieties failed to fully recover their pristine vigor, the result being fewer crowns, in the case of hills, and more limited stands of plants in matted rows, though the latter obviously overcame such check more promptly than did the larger hill plants, a circumstance which may be supposed to account for the fact that the relative productiveness of varieties under hill and matted row culture is very generally reversed, as compared with that of 1891, at which time no serious checks upon the development of the plants occurred during their season of growth.

The present plat was treated to a spray of Bordeaux mixture (4 lbs. copper sulphate, 3 lbs. lime and 32 gallons of water), prior to the advent of freezing weather last fall, and it was repeated on the sixth of April last. Apparently from this cause, the entire plat has been free from attacks of fungi throughout the season—at least till the 29th of July, when it was plowed under.

Whether from the same cause or otherwise, the plat was also almost wholly free from the depredations of insects. Only a very few leaf-rollers were observed, which were at once destroyed when discovered.

It will be observed that in the naming of varieties we have applied the rules of nomenclature of the American Pomological society, and the practice of the National Division of Pomology under them; in case of possible doubt, inserting the objectionable word in parenthesis as a synonym.

We omit all tabulated descriptions of varieties, since such must necessarily be too brief and imperfect to be valuable for identification.

STRAWBERRIES—(*Fragaria*).

Numbers.	Names.	b, Bi-sexual; n, p, nearly pistillate; p, pistillate.	Origin.	First planted.	First bloom.	First picking.	Last picking.	Vigor—Scale, 1 to 10.	Ounces.	
									Product with hill culture.	Product in matted row.
1	Accomac	b	Del.	1892	May 22	June 21	July 7	3	29	20
2	Afton	p	N. Y.	1892	" 25	" 21	" 3	3	14	16
3	Alabama	p	Ala.	1890	" 22	" 21	" 7	3	22	30
4	Alpha	p	Ont.	1881	" 22	" 21	" 7	3	30	18
5	American (Great)	b	N. J.	1878	" 20	" 17	" 17	6	54	192
6	Atlantic	b	N. J.	1890	" 22	" 21	" 14	8	86	197
7	Auburn	p	N. Y.	1892	" 26	" 21	" 12	9	29	74
8	Augwick	p	N. Y.	1892	" 22	" 21	" 14	9	44	131
9	Banquet	p	N. Y.	1892	" 10	" 5	" 14	9	50	160
10	Barton (Eclipse)	p	Div. Pom.	1891	" 22	" 23	" 14	8	63	130
11	Beder Wood	b	Ill.	1890	" 12	" 22	" 14	8	100	485
12	Beebe	b	N. J.	1892	" 22	" 23	" 5	5	29	74
13	Belmont	b	Mass.	1885	" 22	" 23	" 10	7	40	79
14	Bessie	p	Ala.	1890	" 15	" 16	" 3	10	88	79
15	Belts (3)	b		1892	" 12	" 17	" 14	10	70	32
16	Beauty	b	Ind.	1892	" 17	" 21	" 5	6	29	65
17	Beverly	b	Mass.	1892	" 22	" 21	" 3	3	45	42
18	Bidwell	b	Mich.	1876	May 22	June 21	July 10	5	45	42
19	Boynton	p	Ohio.	1891	" 22	" 21	" 12	3	24	25
20	Brunette	p	Ind.	1892	" 19	June 16	July 5	7	24	25
21	Bubach (5)	p	Ill.	1888	" 22	" 21	" 12	8	73	159
22	Bubach (24)	b	Ill.	1890	" 19	" 19	" 3	5	21	75
23	Bubach (132)	b	Ill.	1890	" 17	" 19	" 7	7	35	90
24	Bubach (137)	b	Ill.	1890	" 12	" 17	" 7	5	85	66
25	Burt	b	N. Y.	1889	" 19	" 19	" 7	8	64	174
26	California		Del.	1891						
27	Cameronian	b	Ohio.	1892	May 22	June 23	July 12	9	46	91
28	Centennial (Ohio)	b	Ohio.	1892	" 24	" 23	" 17	5	74	191
29	Charleston	b	Ohio.	1890	" 22	" 23	" 12	4	13	12
30	Clark	b	Md.	1892	" 10	" 17	June 30	8	41	38
31	Cleveland (Mrs.)	p	Ohio.	1888	" 17	" 19	July 10	6	56	83
32	Clingto	b	Ohio.	1890	" 12	" 23	" 10	4	15	33
33	Clond	p	La.	1888	" 28	" 23	" 10	7	62	135
34	Covell	b	N. J.	1888	" 10	" 16	June 30	6	63	93
35	Crawford	b	Ohio.	1889	" 12	" 21	July 7	7	32	---
36	Crescent	p	Conn.	1880	" 17	" 21	" 7	7	43	227
37	Cumberland	b	Penn.	1880	" 24	" 21	" 14	9	56	136
38	Curtis (15)	b	Ill.	1892	" 15	" 21	" 5	5	41	31
39	Curtis (159)	p	Ill.	1892	" 20	" 21	" 12	8	35	126
40	Daisy	p	Ohio.	1890	" 24	" 21	" 7	6	65	71
41	Dayton		Ohio.	1892	" 22	" 21	June 30	8	10	---
42	Dew	b	Mich.	1889	" 29	" 26	July 12	10	30	33
43	Dutter	b	Ind.	1889	" 24	" 26	" 12	6	27	38
44	Edgar	p	Ill.	1890	" 20	" 23	" 17	7	101	168
45	Engle (1)	b	Mich.	1890	" 8	" 21	" 17	8	8	120
46	Enhance	b	Ohio.	1890	" 12	" 19	" 10	6	88	50
47	Estelle	b	Mich.	1891	" 20	" 26	" 17	6	36	87
48	Eureka	p	Ohio.	1888	" 22	" 26	" 14	7	78	131
49	Fairmount	b	N. J.	1891	" 20	" 21	" 10	7	76	163
50	Farnsworth	b	Ohio.	1891	" 22	" 21	" 14	5	27	104
51	Felton	b	Ohio.	1890	" 22	" 26	" 17	7	56	84
52	Florence	b	Ohio.	1888	" 22	" 21	" 14	6	38	38
53	Gandy	b	N. J.	1887	" 24	" 26	" 14	7	13	112
54	Gem (Nehring)	p	Ill.	1890	" 17	" 19	" 12	10	48	79
55	Glendale	b	Ohio.	1882	" 22	" 23	" 12	8	43	135
56	Gillespie	b	Ohio.	1891	" 12	" 21	" 7	5	38	28

Not fully tested.  
New.  
Needs further trial.

Planted too late.

Needs further trial.

Try further.

Needs a longer trial.  
Imperfectly tested.

Much like Wilson.

Untested.  
Needs further trial.  
Promising.

Try further.

Not productive enough.

Southern.

Plants lacking.

Large; lacks color.

But imperfectly tested.  
Large; late.  
Uncertain value.  
New; promising.  
Of Paw Paw, Michigan.

Usually very productive.  
From Paw Paw, Michigan.  
Promising.

Popular; late.  
Usually productive.  
Old; late.  
Needs further trial.

## STRAWBERRIES—CONTINUED.

Numbers.	Names.	b, bi-sexual; n p, nearly pistillate; p, pistillate.	Origin.	First planted.	First bloom.	First picking.	Last picking.	Ounces.			
								Vigor—Scale, 1 to 10.	Product with hill culture.	Product in matted row.	
57	Greenville .....	p	Ohio .....	1891	May 19	June 23	July 12	7	42	147	Promising.
58	Hampton .....	p	Mass. ....	1889	" 20	" 26	" 20	5	52	51	
59	Hatfield .....	p	N. J. ....	1890	" 20	" 21	" 7	11	51	51	
60	Hattie (Jones) .....	p	Ind. ....	1892	" 20	" 23	" 12	7	121	93	Promises well.
61	Haverland .....	p	N. J. ....	1887	" 19	" 21	" 12	7	81	179	Valuable.
62	Henderson .....	b	N. J. ....	1888	" 26	" 23	" 7	5	18	17	Superior quality.
63	Hermit .....	b	Ohio .....	1892	" 19	" 23	" 12	9	54	120	Promising.
64	Hinman .....	b	" .....	1890	" 22	" 21	" 14	8	64	69	
65	Hoar .....	b	Wis. ....	1888	" 19	" 23	" 10	8	51	135	Worthy of trial.
66	Hoffman .....	b	N. J. ....	1889	" 22	" 21	" 5	5	9	29	Southern.
67	Holyoke .....	b	Mass. ....	1891	" 15	" 21	" 12	6	86	194	Try further.
68	Howard .....	p	Mass. ....	1892	" 26	" 21	" 5	6	16	92	
69	Hugo .....	p	N. J. ....	1891	" 12	" 16	" 7	7	118	147	Named for Victor Hugo.
70	Huntsman .....	b	Mo. ....	1892	" 15	" 17	" 8	8	15	31	New.
71	Hyslop .....		Del. ....	1892				4			Not fruited.
72	Iowa (Beauty) .....		Iowa .....	1892				5			Not fruited.
73	Ivanhoe .....	b	Ohio .....	1889	May 22	June 21	July 7	6	53	101	
74	Jessie .....	b	Wis. ....	1889	" 15	" 21	" 10	5	63	89	
75	Jones .....	b	Ind. ....	1892	" 19	" 21	" 5	7	20	41	Need longer trial.
76	Jacunda Improved .....	b	N. J. ....	1890	" 30	" 23	" 12	7	61	56	Scarcely improved.
77	Katie .....	b	Ind. ....	1892	" 22	" 21	" 12	7	30	50	Try further.
78	Kentucky .....	b	Ken. ....	1876	" 24	" 26	" 17	10	70	95	Old; late.
79	Leader .....	b	Ohio .....	1892	" 12	" 16	" 10	7	39	41	Needs further trial.
80	Lehigh .....	p	Pa. ....	1891	" 12	" 16	" 7	7	65	123	Promises well.
81	Leroy .....		Ind. ....	1892	" 17	" 23	" 12	6	43	78	
82	Leviathan .....	b	Ohio .....	1892	" 19	" 16	" 5	8	16	11	Imperfectly tested.
83	Lida .....	p	N. J. ....	1886	" 10	" 16	" 10	4	38	41	
84	Lillie (Monroe) .....	b	Cal. ....	1891	" 19	" 23	" 7	5	27	43	From California.
85	Lincoln .....	p	Del. ....	1892	" 19	" 21	" 7	7	70	216	May be a re-introduction.
86	Logan .....	b	Ind. ....	1885	" 22	" 21	" 12	6	48	76	
87	Louise .....	b	N. Y. ....	1889	" 31	" 26	" 12	6	51	43	Has desirable qualities.
88	Lovett .....	b	N. J. ....	1891	" 24	" 21	" 12	7	57	133	Old; late.
89	Mammoth .....	b	N. J. ....	" 24	" 23	" 17	8	53	87		Of medium season.
90	Manchester .....	p	N. J. ....	1880	" 17	" 23	" 17	6	137	280	Old; valuable.
91	Mark .....	b	Ohio .....	1890	" 22	" 23	" 17	5	37	64	
92	Martha .....	n p	Minn. ....	1887	" 17	" 21	" 12	7	139	108	
93	Miami .....	n p	Ohio .....	1889	" 22	" 21	" 14	6	67	86	
94	Miller .....	b	N. J. ....	1890	" 20	" 23	" 12	7	49	63	
95	Michel .....	b	Ark. ....	1890	" 15	" 16	" 5	8	65	105	Of little value here.
96	Miner .....	b	N. J. ....	1878	" 22	" 23	" 10	7	65	164	
97	Monarch (Ohio) .....	b	Ohio .....	1891	" 20	" 23	" 7	6	25	102	
98	Monmouth .....	b	N. J. ....	1885	" 26	" 23	" 14	6	44	79	
99	Moore .....	b	Mich. ....	1889	" 27	" 23	" 10	6	35	99	
100	Muskingum .....	b	Ohio .....	1892	" 24	" 21	" 12	6	28	92	Needs further trial.
101	Mystic .....	b	Ind. ....	1892	" 20	" 26	" 10	6	28	36	Try further.
102	Neptune .....	p	Ohio .....	1890	" 26	" 26	" 17	6	47	122	
103	Novelt (White) .....	b	N. J. ....	1892	" 22	" 21	June 21	2	8		A fancy variety, <i>F. vesca</i>
104	Oliver .....	p	Ill. ....	1890	" 22	" 26	July 17	9	65	118	
105	Omega .....	p	N. J. ....	1891	" 22	" 21	" 10	9	86	116	
106	Oregon (Everbearing) .....	p	Ohio .....	1891	" 15	" 21	" 17	7	66	173	Try further.
107	Osceola (Michel) .....	b	Mo. ....	1890	" 9	" 21	June 26	8	19	58	Identical with Michel.
108	Pacific (Great) .....	p	Ill. ....	1890	" 22	" 22	July 14	8	109	137	A market variety.
109	Parker Earle .....	p	Texas ....	1889	" 24	" 23	" 17	8	82	127	One of the best.
110	Parry .....	b	N. J. ....	1886	" 22	" 23	" 14	6	38	89	Large; high quality.
111	Pearl .....	b	N. J. ....	1888	" 19	" 23	" 14	8	130	115	
112	Pineapple .....	b	Ohio .....	1889	" 22	" 23	" 7	7	32	66	

## STRAWBERRIES—CONTINUED.

Numbers.	Names.	b, bi-sexual; n p, nearly pistillate; p, pistillate.	Origin.	First planted.	First bloom.	First picking.	Last picking.	Ounces.			
								Vigor—Scale, 1 to 10.	Product with hill culture.	Product in matted row.	
113	Porter .....	b	N. J. ....	1890	May 27	June 21	July 10	6	64	75	Try further. Give further trial. Excellent; unprofitable.
114	Price .....	b	N. Y. ....	1892	" 30	" 21	" 21	5	9	58	
115	Princess .....	p	Minn. ....	1892	" 27	" 13	" 10	6	35	97	
116	Prince (of Berries) .....	b	N. J. ....	1887	" 32	" 17	" 7	4	19	50	
117	Puritan .....	p	Ohio. ....	1887	" 12	" 17	" 7	6	33	19	
118	Putnam (Gen'l) .....	b	Ct. ....	1890	" 19	" 21	" 12	10	62	105	Promising.
119	Regina .....	p	Ala. ....	1890	" 29	" 26	" 14	9	25	63	Market variety.
120	Rusk .....	n p	Ill. ....	1889	" 12	" 21	" 13	7	59	160	
121	Sadie .....	p	Ohio. ....	1890	" 9	" 16	" 7	5	54	187	
122	Sandoval .....	b	Ill. ....	1890	" 12	" 21	" 14	4	51	126	Warfield, No. 1.
123	Saunders .....	b	Ont. ....	1889	" 26	" 21	" 10	9	83	178	Valuable.
124	Scarlet Ball .....	p	" .....	1892	" 29	" 26	" 14	9	33	35	Needs longer trial.
125	Sharpless .....	b	Pa. ....	1875	" 24	" 23	" 12	5	30	80	
126	Shaw .....	b	Ont. ....	1890	" 24	" 23	" 14	7	55	86	Valued east.
127	Shuster .....	b	N. J. ....	1891	" 23	" 21	" 10	6	74	157	
128	Sonthard .....	b	Ct. ....	1892	" 15	" 19	" 3	5	37	67	Promising. Try more fully. Good.
129	Speece .....	b	Mo. ....	1890	" 20	" 19	" 10	7	102	122	
130	Standard .....	b	Ct. ....	1892	" 12	" 17	" 3	6	41	155	
131	Stayman (1) .....	n p	Kas. ....	1890	" 26	" 21	" 10	9	104	156	
132	Stayman (2) .....	n p	Kas. ....	1890	" 17	" 21	" 10	8	78	88	
133	Stevens .....	b	Ala. ....	1890	" 12	" 17	" 3	7	38	86	May be the old Surprise. An unfortunate name.
134	Sucker (State) .....	b	Ill. ....	1890	" 29	" 23	" 12	7	26	49	
135	Surprise .....	b	Del. ....	1892	" 30	" 26	June 30	7	17	50	
136	Swindle .....	p	Vt. ....	1892	" 22	" 23	July 12	6	124	124	
137	Thompson (1) .....	b	Ohio. ....	1890	" 22	" 23	" 5	3	12	6	
138	Thompson (4) .....	b	Ohio. ....	1890	" 12	" 19	" 10	8	50	64	Promising.
139	Thompson (5) .....	b	Ohio. ....	1890	" 15	" 21	" 7	7	85	185	
140	Thompson (7) .....	p	Ohio. ....	1890	" 19	" 21	July 12	6	85	185	
141	Thompson (8) .....	p	Ohio. ....	1890	" 12	" 21	" 12	8	70	110	
142	Thompson (9) .....	b	Ohio. ....	1890	" 19	" 21	" 3	7	52	60	
143	Thompson (17) .....	p	Ohio. ....	1890	" 20	" 26	" 12	6	39	33	Promising.
144	Thompson (25) .....	b	Ohio. ....	1890	" 26	" 23	" 12	7	57	83	
145	Thompson (26) .....	p	Ohio. ....	1890	" 22	" 23	" 12	8	46	187	
146	Thompson (31) .....	p	Ohio. ....	1890	" 20	" 21	" 10	9	96	213	
147	Thompson (34) .....	p	Ohio. ....	1890	" 19	" 21	" 10	5	95	73	
148	Thirty-one .....	b	Ind. ....	1892	" 22	" 23	" 12	8	34	72	Promises well.
149	Tippecanoe .....	b	Ind. ....	1890	" 17	" 19	" 5	9	35	73	
150	Townsend (2) .....	b	Ohio. ....	1888	" 24	" 26	" 10	7	15	39	
151	Townsend (3) .....	p	Ohio. ....	1888	" 24	" 23	" 10	6	47	76	
152	Townsend (19) .....	p	Ohio. ....	1888	" 19	" 21	" 12	8	118	183	
153	Townsend (20) .....	p	Ohio. ....	1888	" 29	" 23	" 12	6	73	142	Fruit lacks size. - Not fruited.
154	Triomphe (de Gand) .....	b	Belg. ....	1876	" 27	" 26	" 17	7	41	57	
155	Vernon (Mt.) .....	b	Kas. ....	1877	" 19	" 21	" 14	5	53	122	
156	Vick .....	b	Mo. ....	1878	" 22	" 23	" 10	6	97	206	
157	Viola .....	b	Ohio. ....	1890	" .....	" .....	" .....	7	..	..	
158	Waldron .....	p	Ohio. ....	1891	May 20	June 17	July 7	5	27	43	Try further.
159	Walton .....	p	N. J. ....	1890	" 20	" 23	" 14	6	51	130	Promises well
160	Warfield (2) .....	p	Ill. ....	1890	" 20	" 21	" 10	9	94	349	Well known.
161	Westbrook .....	p	N. Y. ....	1891	" 15	" 17	June 30	7	25	75	Or Blue Vine.
162	Weston .....	p	Wis. ....	1891	" 29	" 23	July 12	5	37	62	
163	Williams .....	b	Ohio. ....	1892	" 29	" 21	" 14	8	56	152	Very promising.
164	Wilson .....	b	N. Y. ....	1876	" 15	" 21	" 12	8	124	168	Old; well known.
165	Windor .....	p	Mich. ....	1880	" 17	" 17	" 14	6	96	125	Old; well known.
166	Woolverton .....	b	Ont. ....	1891	" 17	" 16	" 7	9	38	41	Give it a better trial.
167	Yale .....	b	Ct. ....	1890	" 24	" 23	" 14	8	44	49	Valued at the east.

Brief notices are appended of such varieties only as have yielded not less than one hundred and fifty ounces of fruit from a row of thirteen plants, either in hills or in a matted row.

American (Great American), bisexual; originated in New Jersey. It was exhibited, by the originator, at the Centennial Exposition, where it received the highest commendation. It originated under high cultivation and has only proved satisfactory when grown under similar conditions.

Atlantic, bisexual, is a comparatively old variety which, though fairly productive and generally acceptable, has not gained a high standing, so far as profitableness is concerned.

Augwick, pistillate, is but recently introduced. The plant is vigorous and productive, and the berry large, firm, and of medium quality. It has only fruited here this season.

Banquet, pistillate, is new, having only fruited here this season. The plant is vigorous and fairly productive, and the fruit of medium size and quality.

Beder Wood, bisexual, has now fruited here three years, and, both here and elsewhere, has won high reputation for vigor and productiveness. In form, color, firmness, and quality, it promises well as a market berry. Origin, Illinois.

Centennial (Ohio Centennial) bisexual, is a seedling from southwestern Ohio, and was so named from having first fruited during Ohio's centennial year. It is vigorous and fairly productive, and the fruit quite large, and of much more than average quality. It promises value for market purposes.

Crescent, pistillate, has been too long and favorably known to require a lengthy notice. Too soft for distant marketing, its hardiness, vigor, and great productiveness render it desirable for near markets, though it is, to a considerable extent, confined to a low grade of cultivation.

Edgar (Edgar Queen), pistillate, is a fairly vigorous and productive plant; named for Edgar county, Ill., its place of origin. It is comparatively new, and has not yet a well established reputation. The fruit is large, of good form, attractive color; of high quality for so large a fruit.

Fairmount, bisexual, originated in New Jersey; was received for trial from the National Division of Pomology, during the hot, dry summer of 1890. We have been unable to fruit it satisfactorily till this season. The plant is of fully average vigor, and, so far, is fairly productive. Size, above medium; quality, medium.

Haverland, pistillate, introduced several years since, as larger and of higher quality than Crescent, as well as its rival in productiveness, has scarcely verified this latter claim and, either for that reason or for the less satisfactory character of the plant, the variety has not acquired the anticipated popularity with commercial planters.

Holyoke (Mount Holyoke), bisexual, although received as early as 1891, has not been in condition to satisfactorily manifest its qualities till the present season. So far, the plant seems to possess more than average vigor and productiveness. The fruit also ranks high, so far as both size and quality are concerned.

Hugo (Victor Hugo), bisexual, originated in New Jersey, but was received for trial from the Division of Pomology. The plant is very vigorous, and of more than medium productiveness. The fruit is large to very large, and of satisfactory form, color, and quality. So far it seems to be well worthy of trial as a market variety.

Lincoln, pistillate, is of more than average vigor, and very productive; fruit large, color attractive, but of scarcely medium quality. In the absence of a history of its origin, its tendency to grow misshapen or cockscombed fruits would seem to warrant the suspicion that it may be merely a re-introduction of the President Lincoln of the previous decade.

Manchester, pistillate, is too well known to require extended notice. Inclined, as it is, to overbear, if in good soil, with high culture and a renewal of the plantation after each full crop, it proves eminently profitable.

Miner, bisexual, though an old and productive variety, under favorable conditions, may now be properly laid aside in favor of newer and more desirable varieties.

Oregon (Oregon Everbearing), pistillate, hails from Ohio. Whatever its habit may be in its original locality, it is not a continuous bearer here, although the plant is vigorous and fairly productive in the usual season of this fruit. In size and quality it is fully medium. This is its first fruiting here, and improved conditions in the future may develop more favorable results.

Rusk (Lady Rusk), nearly pistillate, was received from Illinois in 1889. In vigor of plant it is above medium. In productiveness it scarcely realizes the commercial requirement of the day. Fruit of more than medium size, firm, of good form and color, and of medium quality.

Sadie, pistillate, is vigorous, and has, this season, proved more than usually productive. The fruit is of less than medium size and of medium quality and texture.

Saunders, bisexual, is a very vigorous and productive plant; originated by John Little of Ontario and named for one of the most noted horticulturists of the Dominion. In size, quality, and firmness it is quite above medium. It is worthy of extensive trial as a market berry.

Shuster (Shuster's Gem), nearly pistillate, is a popular variety in some parts of the east, though apparently less in favor at the west. Here the plant is above medium in vigor and productiveness, and slightly so also in size of fruit, though of only medium firmness and quality.

Stayman (No. 1), nearly pistillate, is very vigorous and productive, of only medium size, and scarcely of medium quality. It is probably more at home in its native Kansas.

Thompson (No. 7), pistillate, comes to us from Ohio. It has not been favorably conditioned heretofore. This season it has proved quite productive; above medium in vigor, quality, and firmness, though of only medium size.

Thompson (No. 26), pistillate, from the same source with the foregoing, has more vigor of plant and rather larger fruit, of only medium firmness, and quite low in quality.

Thompson (No. 31), pistillate, is vigorous in plant and large in fruit, but only medium in texture and quality. Its more than usual productiveness and size render it desirable for a near market.

Townsend (No. 19), pistillate, has, this season, shown more than medium vigor and productiveness. The fruit is large, though only medium in texture and quality.

Vick (James Vick), bisexual, is a low-growing, very hardy plant, of scarcely more than medium vigor, which, this season, has fairly exceeded itself in productiveness. The fruit, though rich and bright in color, is of less than medium size, though of firm texture and high flavor.

Warfield (No. 2), pistillate, is too well and favorably known to require description. It is generally prized as a market fruit.

Williams, bisexual is vigorous and of more than average productiveness. The fruit is large, firm, and of more than medium quality. It may be regarded as a promising variety for both home use and market.

Wilson, bisexual. This old and once universally popular variety is noticed here, mainly, as a medium for comparison. When well grown and free from fungous diseases it is yet fairly productive, and, when allowed to thoroughly ripen upon the plant, it has even yet few, if any, superiors, all things considered.

#### RASPBERRIES (*Rubus*).

So many plants, in the trial plat of raspberries, were either killed or seriously injured by the persistent rainy weather of the spring of 1892, that although those remaining have generally recovered quite rapidly, and are now generally in thrifty condition, there are so many vacancies and such unevenness in the size and fruiting condition of the remaining plants that a comparison of actual products would afford but an imperfect and even erroneous idea of the relative productiveness of the varieties when under equivalent conditions. For this reason the productiveness of the several varieties is estimated upon a scale of 1 to 10.

The plat of raspberries was included in the general spraying with Bordeaux mixture of the usual strength (4 pounds copper sulphate, 3 pounds of lime, and 32 gallons of water) applied to the plantation late last fall, with the purpose to destroy, so far as possible, the winter spores of fungi.

A spray was again given on the 3d of April last, prior to the commencement of the season's growth, with the same material and strength.

This was repeated April 24, with the same mixture, and with the addition of two ounces of Paris green for each 32 gallons of water.

On the 9th of May the plat received a final spray, with a still weaker solution, consisting of 2 pounds of copper sulphate, 1½ pounds of lime, and 2 ounces of Paris green, in 22 gallons of water.

Early last spring all canes, whether new or old, seriously affected with anthracnose were cut away and burned.

Whether as the result of these sprayings and pruning, or otherwise, scarcely a trace of anthracnose has been visible upon the growths of this season, while the foliage has remained perfect throughout the entire period, and neither the attacks of fungi nor the depredations of insects have at any time proved troublesome.

Dry weather and extreme heat during the ripening season occasioned the blasting or withering of more or less of the immature fruit of several varieties.

#### 1. *Rubus Idæus*.

##### Varieties of European origin.

Number.	Name.	Origin.	Planted.	First bloom.	First ripe fruit.	Productiveness, Scale, 1 to 10.	Remarks.
1	Herstine.....	Penn.	1888	June 12.	July 6..	6	Excellent; requires protection.
2	Superb.....	N. J.	1888	" 13.	" 19..	4	Hardy; fruit large, dark purple.

2. *Rubus neglectus*.

Botanists include, in this species, several varieties, by many assumed to be hybrids between *Occidentalis* and other species.

Number.	Name.	Origin.	Planted.	First bloom.	First ripe fruit.	Productiveness, Scale, 1 to 10.	Remarks.
1	Caroline .....	N. Y. ....	1888	June 12.	July 10.	10	Yellow; hardy; very productive.
2	Griesa .....	Kan. ....	1890	" 12.	" 10.	8	Roots by both tips and suckers.
3	Muskingum .....	Ohio .....	1890	" 15.	" 14.	10	Very vigorous; new; valuable.
4	Reliance .....	N. J. ....	1888	" 12.	" 8.	8	Very hardy; dark; purple.
5	Shaffer .....	N. Y. ....	1888	" 15.	" 14.	9	Tip rooting; large; dark purple.

3. *Rubus occidentalis*.

Black and yellow tip-rooting.

Number.	Name.	Origin.	Planted.	First bloom.	First ripe fruit.	Productiveness, Scale, 1 to 10.	Remarks.
1	Ada .....	Ohio .....	1888	June 15.	July 17.	6	So far is not valuable.
2	American Everbearing .....	Ohio .....	1893				Has not yet fruited.
3	Beebe .....	N. Y. ....	1888	June 10.	July 10.	9	Yellow; unsightly if overripe.
4	Canada .....	Ont. ....	1891	" 13.	" 12.	6	Of doubtful value.
5	Carman .....	Conn. ....	1888	" 10.	" 8.	8	Good; but not relatively profitable.
6	Centennial .....		1888	" 12.	" 12.	8	Not relatively profitable.
7	Conrath (Early) .....	Mich. ....	1891	" 15.	" 15.	9	Highly promising.
8	Cromwell .....	Conn. ....	1888	" 10.	" 10.	5	Injured by last year's wet.
9	Doolittle .....	N. Y. ....	1888	" 10.	" 8.	5	Generally profitable.
10	Doomore .....	Ohio .....	1888	" 12.	" 10.	4	Is unprofitable.
11	Earhart .....	Ill. ....	1888	" 10.	" 8.	8	Yields a second crop in autumn.
12	Farnsworth .....	Ohio .....	1891		" 12.	3	Promising; needs further trial.
13	Gregg .....	Ind. ....	1888	June 14.	" 29.		Badly injured last year.
14	Hathaway (1) .....	Mich. ....	1891				Not yet fruited.
15	Hathaway (2) .....	Mich. ....	1891				Not yet fruited.
16	Hilborn .....	Ont. ....	1888	June 14.	July 21.		Badly injured by last year's wet.
17	Hopkins .....	Mo. ....	1888	" 12.	" 10.	5	Suffered from wet last year.
18	Idaho .....	Ohio? ..	1889	" 13.	" 17.	4	Badly killed last year.
19	Indiana .....	Ind. ....	1888	" 10.	" 8.	4	Badly injured last year.
20	Johnston (Sweet) .....	N. Y. ....	1888	" 13.	" 14.		Nearly ruined last year.
21	Kansas .....	Kan. ....	1889	" 13.	" 19.	2	Nearly ruined last year.
22	Lovett (Early) .....	N. J. ....	1892				Not yet fruited.
23	Mammoth Cluster .....	N. Y. ....	1888	June 10.	July 14.	6	Plants considerably injured.
24	Mohler .....	Ohio .....	1892				A few fruits on current year's canes.
25	Nemaha .....	Neb. ....	1888				Nearly ruined by wet last year.
26	Ohio .....	N. Y. ....	1888	June 10.	July 10.	10	Very productive, too seedy.
27	Older .....	N. J. ....	1891		" 12.		Fruited but slightly.
28	Palmer .....	Ohio .....	1890	June 10.	" 8.	10	The best early blackcap.
29	Progress .....	N. J. ....	1890				No fruit this year.
30	Rundell .....	Mich. ....	1890	June 10.	July 12.	10	A reproduction of Beebe.
31	Smith (Giant) .....	Ont. ....	1889	" 13.	" 17.	10	Very vigorous and productive.
32	Soubegan .....	N. E. ....	1888	" 10.	" 7.	6	Usually an excellent early variety.
33	Surrey .....	Ohio .....	1889	" 13.	" 20.	1	But imperfectly tested.
34	Sweet Home .....	Ohio .....	1890	" 14.	" 15.	2	So far, not promising.
35	Tyler .....		1888	" 10.	" 8.	7	Practically identical with Soubegan.
36	Virginia .....	Ohio .....	1889	" 10.	" 10.	6	Not promising, so far.
37	Winona .....	Ohio .....	1891	" 14.	" 17.		Was nearly ruined last season by wet.

4. *Rubus phoenicolasius*.

Number.	Name.	Origin.	Planted.	First bloom.	First ripe fruit.	Productiveness, Scale, 1 to 10.	Remarks.
1	Japanese Wineberry ..	Japan ..	1891	June 27.	.....	1	Worthless except for the beauty of its bloom and foliage.

5. *Rubus strigosus*.

Number.	Name.	Origin.	Planted.	First bloom.	First ripe fruit.	Productiveness, Scale, 1 to 10.	Remarks.
1	Brandywine .....	Penn.....	1888	June 15.	July 10.	9	Hardy. A good market variety.
2	Church (Royal Church) ..	Ohio.....	1892	" 14.	" 17.	1	Has not yet shown its true quality.
3	Cuthbert .....	N. Y.....	1888	" 17.	" 11.	8	Has no superior in its class.
4	Early King .....	Va. ? .....	1893	.....	.....	.....	Not yet fruited.
5	Eastern King .....	N. E. ....	1888	June 12.	July 10.	7	A good family berry.
6	Gladstone .....	N. Y.....	1892	" 14.	" 14.	5	Needs further trial.
7	Golden Queen .....	N. J.....	1888	" 15.	" 14.	8	Excellent for home use.
8	Hansell .....	N. J.....	1888	" 12.	" 8.	6	One of the earliest.
9	Marlboro .....	N. Y.....	1888	" 12.	" 10.	4	Next to Cuthbert for market.
10	Reder .....	Mich.....	1888	" 12.	" 10.	4	Large, bright colored, high quality.
11	Scarlet Gem .....	.....	1888	" 12.	" 10.	6	Beautiful; but not relatively profitable.
12	Thompson .....	Ohio.....	1888	" 12.	" 8.	9	A good early variety.
13	Thwack .....	.....	1892	" 15.	" 15.	1	Vigorous, productive, poor in quality.
14	Turner .....	Ill. ....	1888	" 12.	" 10.	4	Very hardy; canes without spines.

Notices are appended of the more desirable varieties, also of other more recent ones not yet fully tested.

## BLACK OR YELLOW CAPS.—TIP-ROOTING.

Beebe—A yellow variety, very productive; of fair quality if used promptly, but if allowed to become overripe the color becomes dark and forbidding, with loss of flavor.

Rundell (the name of the originator), a more recent seedling from southwestern Michigan, is merely a reproduction of the Beebe, with the same general characteristics.

Cromwell has now been several years before the public, and seems to be winning a good reputation as an early blackcap, ripening nearly with Tyler, and surely quite as early as Doolittle.

Doolittle was the forerunner, introducing the blackcaps to cultivation. It even yet maintains a creditable standing among the various rivals which have since arisen to contest with it for popular favor.

Earhart produces a light crop at the usual blackberry season, and also a second crop in autumn, upon the canes of the current season's growth. It may be desirable in the home plat, as a means of supplying this fruit out of the usual season.

Farnsworth, a recent variety from Ohio, has only fruited here this sea-

son. It gives indications of value, as a fruit of medium season, for both the home and market.

Gregg is too well known as a profitable, strictly market, variety to require special notice. Aside from its dense pubescence and rather low quality, its chief fault is lack of hardiness.

Hilborn has not, so far, acquired a wide reputation as either a family or market variety, although, to the writer's apprehension, it deserves a position nearly or quite at the head of the list, so far as quality is concerned.

Nemaha is a reproduction of the Gregg, with improved hardiness, as alleged by those who claim to have thoroughly tested it.

Ohio is popular as a hardy, vigorous, and very productive variety. It is specially commended for its large, proportionate yield of the dried product; but it is doubtless true that the increased yield consists not of dried pulp, but of seeds instead.

Palmer, origin Ohio, proves to be early for a blackcap, and one of the finest and most vigorous and productive of its season.

Smith (Smith's Giant), so far, has proved to be exceedingly vigorous and very productive. It hails from Ontario, which may be taken as assurance of its hardiness.

Souhegan and Tyler, although doubtless of separate origin, are, for all practical purposes, identical. They are valued especially for earliness, although somewhat lacking in both size and productiveness, as compared with several later varieties.

Sweet Home is an old variety which seems not to have taken a hold upon popular favor, or to have developed specially valuable qualities. A limited experience with it here gives little promise of better results.

#### RED, YELLOW AND PURPLE VARIETIES.

Increasing by root-suckers; a few of which are also tip-rooting.

Brandywine, though by no means new, is still valued as one of the best red raspberries for marketing. Even when so overripe as to drop from the plant, it may yet be marketed in fair condition.

Caroline is an alleged hybrid between *R. Idæus* and *R. occidentalis*. It is very hardy, and roots from either suckers or tips, though somewhat reluctantly from either. The fruit is of scarcely medium size, pale yellow, of delicate texture, and produced very abundantly. The quality is only medium. Origin, New York.

Cuthbert still holds an unquestioned position, as one of the most desirable of the red varieties, whether for the home plat or for market. The plant is very vigorous and resists mildew of the foliage unusually well.

Golden (Golden Queen) is clear bright yellow in color. Otherwise it is very much like Cuthbert, in both plant and fruit. For the home plat it is excellent.

Griesa (the name of the introducer, temporarily applied) is a red variety. The habit of the plant is intermediate between *R. strigosus* and *R. occidentalis*. Like Caroline, it roots, rather reluctantly, from both suckers and tips. The fruit possesses the general characteristics of *R. strigosus*. It requires further trial to determine the question of productiveness. It hails from Kansas.

Hansell is early, and the plant hardy. It is valued for planting, to a limited extent, for both home use and market, on account of its earliness.

Marlboro, though rather low in quality, is large and bright colored. It is popular as a rather early market variety.

Muskingum is of comparatively recent introduction, coming, as we understand, from Ohio. The plant is exceedingly vigorous and very productive, with characteristics referable mainly to the species *strigosus*, while the fruit has the large size, dark color, and general appearance of Shaffer. It equals Shaffer in productiveness and, like it, is excellent for canning.

Reder (although the plant may not be satisfactory for commercial uses) has few if any superiors in size; rich, bright color, fine texture and flavor, for the table. It is fairly productive. A native of Berrien county, Michigan.

Reliance, like its parent, the old and now abandoned Philadelphia, is very hardy and productive. The fruit is high flavored, but dark colored, and rather small. It is well adapted to localities in which great hardiness is requisite.

Shaffer is too widely known to require extended notice. The vigor and productiveness of the plant, with the high, rich flavor and large size of the fruit, specially adapt it for canning, for which purpose it has long been popular.

Thompson has, this season, proved highly productive. Should it continue thus, it may prove desirable as an early market variety.

Thwack, though only planted last year, was well tested here several years since. It is hardy, vigorous, of good size, and productive, although very low in quality. Although old, it has never become popular for either amateur or market purposes.

Turner is small and very mild in flavor. The plant is vigorous and the canes destitute of spines. It is the hardiest of the red raspberries and (doubtless for that reason) is somewhat popular at the west and north.

Herstine, like all varieties of its species (*Idrus*), tested in this country, lacks hardiness, requiring winter protection, even in the comparatively mild winter climate of southwestern Michigan. On account of its large size, bright color, and superior flavor, it is deemed worthy of the needful winter protection. Origin, Pennsylvania, from seed of a foreign variety.

#### BLACKBERRIES (*Rubus villosus*).

The entire loss of many plants, and the serious injury of others, resulting from the almost continuous drenching rains, during the late spring and early summer of 1892, were but partially remedied by the subsequent growth of that year, leaving the stand of plants decimated or uneven to such extent that comparisons of actual fruitage during this season will afford no just indication of the comparative productiveness of the varieties under ordinary conditions. Under such circumstances, therefore, resort is had to estimates, based upon the actual performance of such plants as appear to be most nearly in a normal condition, results being indicated upon a scale of one to ten.

Anthraxnose having been very prevalent during the year 1892, attacking nearly or quite all the varieties of blackberry as well as of raspberry, the plat was included in the spraying which the plantation received, after the dropping of the foliage in late autumn, 1892. Early last spring

examination was made, and all canes showing indications of anthracnose were cut out and burned.

On April 1 to 3 last, the plants received a spray of Bordeaux.

Again, on April 24 and 25, they were sprayed with reduced Bordeaux, using 32 gallons of water and adding two ounces of Paris green.

A final spray was given on May 8 and 9, using two pounds of copper sulphate with one and one half pounds of lime in 22 gallons of water, and adding two ounces of Paris green.

As the apparent result of these several sprayings, with the removal of the previously diseased canes, scarcely a trace of fungus has at any time during the season appeared upon blackberries, while, in all cases, satisfactory growths have been made.

The leaf miner is apparently not amenable to spraying, having proved increasingly troublesome this season, confining its attacks almost wholly to the blackberry.

BLACKBERRIES—(*Rubus villosus*).

Number.	Name.	Origin.	Planted.	First bloom.	First ripe fruit.	Productiveness, Scale, 1 to 10.	Remarks.
1	Agawam.....	N. E.....	1888	June 12.	July 27.	4	Usually large and fine.
2	Bonanza.....	.....	1888	" 14.	" 27.	4	Name a misnomer.
3	Briton (Ancient Briton).....	Eng.....	1888	" 12.	" 28.	3	Usually over-productive.
4	Childs (Tree).....	.....	1892	.....	.....	.....	Not yet tested.
5	Cluster (Early Cluster).....	N. J.....	1888	June 13.	July 25.	10	Of little value.
6	Eldorado.....	Ohio.....	1892	.....	.....	.....	Not yet tested.
7	Erie.....	Pa.....	1888	June 12.	Aug. 2.	5	Generally productive.
8	Fruitland.....	Ohio.....	1892	.....	.....	.....	Good grower. Not fruited.
9	Harvest (Early Harvest).....	N. J.....	1888	June 13.	July 17.	5	Small. Very early.
10	Hoosac.....	Mass.....	1891	.....	.....	.....	Old. Thornless.
11	King (Early King).....	N. J.....	1890	June 14.	July 21.	10	Very desirable so far.
12	Kittatinny.....	N. J.....	1888	" 14.	" 29.	6	One of the best; rather tender.
13	Knox.....	.....	1888	" 15.	" 27.	5	Large. Bears thinly.
14	Lawton.....	N. Y.....	1888	" 13.	" 27.	4	Old. Often winter-killed.
15	Lincoln.....	.....	1891	" 12.	.....	.....	New. Not yet fruited here.
16	Mammoth (Early Mammoth).....	Ohio.....	1891	" 14.	July 31.	4	Needs farther trial.
17	Minnewaska.....	N. Y.....	1888	" 15.	Aug. 2.	4	Is generally more productive
18	Nevada.....	.....	1888	" 15.	July 27.	3	Not valuable here.
19	Ohmer.....	Ohio.....	1892	.....	" 29.	2	But partially tested.
20	Oregon (Everbearing).....	Oregon.....	1892	.....	.....	.....	Not yet fruited here.
21	Snyder.....	.....	1888	June 10.	July 25.	10	Rather small. Very hardy.
22	Stone.....	Wis.....	1890	" 10.	Aug. 5.	3	Small. Very hardy.
23	Taylor.....	.....	1888	" 12.	July 29.	6	Hardy. Excellent.
24	Thompson (Early).....	Ohio.....	1890	" 13.	" 28.	9	New. Promising.
25	Triumph (Western Triumph).....	.....	1888	" 14.	Aug. 1.	2	Small. Hardy. Vigorous.
26	Wachnsett.....	Mass.....	1890	" 10.	July 27.	5	Old. Thornless.
27	Wallace.....	.....	1888	" 13.	" 29.	5	Large. Very good.
28	Wilson.....	N. J.....	1888	" 13.	" 28.	6	Canes tender. Large. Early.
29	Wilson, Jr.....	N. J.....	1888	" 13.	" 25.	6	Is Wilson reproduced.

Notices are appended of some of the older varieties, with their performance during the current year, together with a few of the more recent introductions.

Agawam has been fruited here for several years. It has rarely, if ever, suffered injury from the lake shore winters. It is productive, and the fruit is large and excellent. It is eminently worthy of a place in the home plat.

Briton (Ancient Briton) has been a long time in cultivation in this country, and is popular at the west, where the larger varieties fail from lack of hardiness. It has been assumed to be a native, but recent investigation determines that it was originally imported from England. Its comparatively small size renders it unpopular where larger though less hardy varieties can be profitably grown.

Erie is very vigorous, with many large, strong, prehensile spines, and is hardy in this climate, though it suffered seriously from the long wet spell of last year. The fruit is very large, and of fair quality, if allowed to fully ripen upon the plant. The habit is spreading and the canes should be tied to a trellis or stakes to prevent injury from high winds.

Harvest (Early Harvest) is a moderately vigorous, very upright grower and very productive. The fruit is rather small, of firm texture, ripening quite in advance of the usual blackberry season, and, for that reason, profitable. A spurious variety, of similar habit, has been disseminated under this name.

King (Early King), received from New Jersey, has fruited here this season only. The plant is vigorous and productive, and the fruit quite large and of good quality, ripening rather early.

Kittatinny has long been recognized as the best of the large varieties, though deficient in hardiness. For some years it has been more or less subject to attacks of the fungus known as red rust, which has, in many cases, proved a serious drawback upon the value of the variety, though it may be held in check, and even exterminated, by promptly digging and burning the diseased plants when discovered.

Lawton, though not the first blackberry subjected to cultivation, was the first one extensively disseminated for such purpose. It lacks hardiness and, as usually marketed, is objectionably acid, though, when thoroughly ripened upon the plant, it is large, sweet, and delicious.

Mammoth (Early Mammoth), was received from a nursery formerly in Ohio (now in Virginia), and has only fruited here this season. It promises well. Fruit large, of good quality, and the plant is vigorous.

Minnewaski was received some years since from its originator, the late A. J. Caywood of New York. The plant is a strong, rather erect grower, productive, and of fully medium hardiness. The fruit is large and of good quality.

Oregon (Everbearing) comes to us as an estray from the Pacific coast, as its name indicates. It has not yet fruited here, though it seems desirable, if only as a curiosity. The plant has the trailing habit of a dewberry with the usual reflexed spines of the blackberry. The foliage has the usual five-leaflet arrangement of the blackberry, with each leaflet somewhat irregularly divided, lobed, and serrated, somewhat after the manner of the cut-leaved birch or maple.

Snyder is well known as a hardy and productive market variety, extensively planted in localities in which special hardiness is requisite.

Stone (Stone's Hardy) hails from Wisconsin. It is a spreading, vigorous grower and very hardy. Fruit too small to be acceptable where larger varieties are successful.

Taylor is nearly as hardy as Snyder, with more branching, light-colored shoots. It is very productive, ripening its rather large, superior-flavored fruit, somewhat after the average season.

Thompson (Early) comes to us from Ohio. It proves hardy here, and

has this year excelled most other varieties in productiveness. The fruit is of fair size and good quality. (Probably Mammoth, L. R. T.)

Triumph (Western Triumph) is one of the varieties approved at the west on account of hardiness. The plant is tall, rather upright, branching, although the fruit is of less than medium size, the deficiency is more than compensated in productiveness. It must have good soil and culture to produce marketable fruit.

Wallace came to us from the west. The plant is vigorous and moderately productive. Fruit of large size and good quality. It is worthy of more attention than it has heretofore received.

Wilson and Wilson Jr. (the latter a seedling of the former) are for all practical purposes identical. Both have, to a slight extent, the spreading habit of the dewberry and, like it, will sometimes root, though reluctantly, from the tips. Both are deficient in hardiness. Fruit large to very small, and not of high quality.

#### SERVICE BERRY.—(*Amelanchier*.)

An indigenous form of this plant, forming a large bush or small tree, occasionally from twelve to fifteen feet in height, is more or less disseminated in Michigan forests. It varies greatly in productiveness, as well as in size and quality of fruit. So far as known, no attempts have been made to subject this to cultivation.

The dwarf variety, which was planted here as early as 1876, under the name Service Berry, only tends, if left undisturbed, to form dense clumps, by means of underground branches or stolons, under which conditions it becomes comparatively unproductive. When such tendency is prevented by occasional transplanting, or otherwise, the result is a very considerable improvement in size, as well as in quantity of fruit.

Birds have a special liking for the fruit, which ripens in succession, and invariably falls a prey to their rapacity, before full maturity.

The bushes rarely exceed three feet in height, and the fruit, which resembles the huckleberry, is by no means its equal in quality.

Three varieties are on trial here.

The first, lacking a varietal name, is designated as *common*. On a scale of one to ten, it ranks, this year, about eight in productiveness.

The second, received from Indiana as Mammoth, is slightly larger in plant, and in productiveness ranks nine.

The third is named "Success" by the recent chief of the Division of Pomology at Washington. In productiveness it will rank ten.

A few plants received a covering of netting, to protect the fruit from the birds. This was applied on July 7, when the fruit began to color. The fruit was gathered about July 18, fully ripe, and beautiful in appearance, though, from lack of rich flavor, it can scarcely supersede the better varieties of huckleberry, where such are obtainable.

#### CURRENTS.—(*Ribes*.)

The plantation of currants suffered more or less from the long continued drenching rains of the spring of 1892, although the most serious injury arose from the cutting away of a large portion of the bearing wood, in the effort to eradicate the twig borer (*Aegeria tipuliformis*, Linn.) which has long been extremely prevalent in this region.

The currants were included in the spraying given the entire plantation, after the fall of the leaves in the autumn of 1892.

A spray with Bordeaux mixture was given them on April 1-3, 1893. They received a second spray on April 18, using 4 lbs. copper sulphate, 3 lbs. lime, and 2 oz. Paris green, in 32 gals. water.

Rain having intervened, a reapplication of the same was given on April 24 to 25.

On May 8-9 another spray was given, using 3 lbs. copper sulphate, 1½ lbs. lime, and 2 oz. Paris green, in 32 gals. water.

The currant worm having put in an appearance, a spray of 2 oz. potassium sulphide (liver of sulphur), and one oz. Paris green, in ten gals. water, was applied on June 2.

This was repeated on June 21, using 3 oz. potassium sulphide instead of two. Rain having intervened, the same was reapplied June 24.

This preparation was again applied on July 6, omitting the Paris green; and yet again for the last time, on July 22.

These sprayings have, apparently, had the effect not only to hold the currant worm in subjection, but also to prevent the attacks of the fungus, which has so generally ruined the foliage early in August, since, under this treatment (which was also applied to the gooseberry), there has been no loss of the foliage of either, down to the time of this writing (Oct. 1), while the plants generally have made satisfactory growth.

It may also be stated, as a possible result of these repeated sprayings, that few indications are visible of the attacks of the twig borer; the inference being, either that the liver of sulphur is repulsive to the moth or, otherwise, that the Paris green may have proved fatal to the larvæ when making their first meal upon the recently sprayed twigs.

#### 1. MISSOURI OR YELLOW FLOWERING CURRANT—(*Ribes aureum*).

Number.	Name.	Origin.	Planted.	First bloom.	First ripe fruit.	Productiveness. Scale 1 to 10.	Remarks.
1	Crandall .....	Kan. ....	1889	May 12..	July 8...	5	Of doubtful value.

#### 2. BLACK, FETID CURRANTS—(*Ribes nigrum*).

Number.	Name.	Origin.	Planted.	First bloom.	First ripe fruit.	Productiveness. Scale 1 to 10.	Remarks.
1	Champion (Black Champion) ..	Europe	1889	May 12..	July 11..	7	Try further.
2	English (Black English) .....	"	1892	" 13..	" 14..	2	Needs further trial.
3	Lee .....	"	1888	" 12..	" 8..	4	One of the best blacks.
4	Naples (Black Naples) .....	"	1888	" 15..	" 10..	4	Old; well known.
5	Saunders .....	Ont. ....	1890	" 15..	" 10..	4	Yet too recent.
6	Wales (Prince of Wales) .....	"	1890	" 12..	" 14..	3	Yet too recent.

3. RED AND WHITE CURRANTS—(*Ribes rubrum*).

Number.	Name.	Origin.	Planted.	First bloom.	First ripe fruit.	Productiveness, scale 1 to 10.	Remarks.
1	Cherry .....	Eur.	1888	May 12	July 14	0	One of the largest. Acid.
2	Fay .....	N. Y.	1888	" 10	" 11	1	Large. Plant unsatisfactory.
3	Holland (Long bunch'd)						
4	Holland .....	Enr.	1889	" 10	" 11	6	Strong, healthy. Late.
5	Lakewood .....	Ohio	1890	" 10	" 14	1	Need a fuller trial.
6	London (Red) .....	Eur.	1890	" 12	" 8	10	Best for culinary uses.
7	Moore Ruby .....	Am.	1890	" 10	" 8	6	Best red variety.
8	Moore Select .....	Mass.	1890	" 10	" 10	0	Requires further trial.
9	North Star .....	Minn.	1892	" 14	July 14	1	Very vigorous. Hardy.
10	Red Dutch .....	Eur.	1888	" 10	" 8	5	Most valuable red currant.
11	Raby Castle .....	"	1892			1	May prove to be Victoria, but said to be distinct.
12	Versaillaise .....	"	1888	May 12	July 10	0	Much like Cherry.
13	Victoria .....	"	1888	" 10	" 10	7	Seldom attacked by borers
14	White Dutch .....	"	1888	" 10	" 10	7	Finest flavored currant.
15	White Gondoin .....	"	1890	" 10	" 8	8	Needs further trial.
16	White Grape .....	"	1888	" 10	" 8	7	Most profitable white variety.
17	Wilder .....	Am.	1890	" 10	" 10	1	Promising.

Owing to the operations of the twig borers during the year 1892, and the amount of bearing wood unavoidably destroyed during the past spring, in the effort to exterminate them, the product of the season now past has been greatly diminished. For this reason the estimates of productiveness given in the foregoing tabulation indicate but imperfectly what would be the relative yield of the varieties named under more favorable conditions. For this reason short notices of some of the varieties are given, for the purpose of, at least in part, remedying such defect.

Crandall (when the heaviest fruiting plants *only* are considered) proves highly productive. The quality of the fruit, when well cooked, is good, but for the extreme thickness and toughness of the skin, even when thoroughly cooked—a difficulty which, apparently, could only be obviated by straining the cooked product.

Naples (Black Naples) and Lee are the only fetid black currants sufficiently tested here. How the remaining varieties upon the list will rank as to quality, size, productiveness, etc., can only be surely determined after a somewhat lengthened trial. From present indications, they differ but slightly in these respects.

White Dutch, White Gondoin, and White Grape rank in about the order named, so far as rich, mild flavor and consequent adaptation as dessert varieties is concerned. In these particulars they are quite superior to any of the red varieties, with the possible exception of the Moore Ruby, which is yet but imperfectly tested.

Cherry, or its close rival, Versaillaise, must be allowed to stand in advance of Fay so far as profitableness and adaptation for market are concerned. All are acid and large and, for that reason, popular in the market.

Red Dutch, although one of the oldest varieties, yet stands first among the red currants, so far as quality as well as productiveness is concerned. But for a slight lack of size, it would doubtless lead also in the market.

Victoria is scarcely as large as Red Dutch and is a little later. On

account of its comparative exemption from the attacks of the twig borer, and the greater persistence of its foliage, it is popular for market planting in many localities.

Holland (Long Bunched Holland) is doubtless the most vigorous of red currants, and holds its very large foliage more persistently than any other of our acquaintance. It is productive and late, the cluster long, but the berry small.

London (London Red) is exceedingly productive, the berry medium, said to be superior for jams and jellies.

Lakewood, Moore Select, and Wilder, though some time on trial, can not yet be definitely characterized.

North Star was planted only last year. It shows unusual vigor, but its other qualities remain undetermined.

Raby Castle, planted in 1892, may prove to be Victoria, although Mr. J. H. Haynes of Delphi, Ind., from whom the plants were obtained, claims that it is a new variety, quite distinct from the old Raby Castle.

### GOOSEBERRY (*Ribes*).

The plantation of gooseberries, being adjacent to that of currants, the two have been subjected to the same treatment, so far as spraying is concerned, for an account of which the reader is referred to the section on currants.

The result of such repeated spraying has been an entire absence of mildew, whether of foliage or fruit, save in the single case of the Smith, which, apparently from previous enfeeblement, has failed to fruit this year, and has also prematurely lost more or less of its foliage.

The use of a few ounces of Paris green in the potassium sulphide spray has kept the currant worm in subjection.

The crumpling of the young leaves at the tips of the branches (mainly of the Houghton), attributable, doubtless, to minute aphides, has been but slightly troublesome this year, it having been cut away and burned upon its appearance.

Nearly all varieties, whether of native or foreign parentage, have fruited very thinly, a result probably due to the enfeeblement consequent upon the excessive and long continued wet weather of early 1892, together with the mildew consequent thereupon, preventing, as it doubtless did, the development of the fruit buds necessary for the next season's crop.

#### 1. WILD GOOSEBERRY—(*Ribes cynosbati*).

Number.	Name.	Origin.	Planted.	First bloom.	First ripe fruit.	Productiveness, Scale, 1 to 10.	Remarks.
1	Downing .....	N. Y. ....	1888	May 9 ..	July 14 ..	3	Valued for market.
2	Mountain .....	N. Y. ....	1888	" 17 ..	" 17 ..	0	Not desirable.
3	Smith .....	N. E. ....	1888	" 10 ..	" ..	0	Poor grower. Fruit superior.
4	Strubler * .....	Ill. ....	1892	.....	.....	.....	Strong grower.
5	Tree* .....	Ohio .....	1892	.....	.....	.....	Strong grower.

\* Nos. 4 and 5 have not yet fruited. Their correct classification is doubtful.

1. EUROPEAN GOOSEBERRY—(*Ribes grossularia*).

Number.	Name.	Origin.	Planted.	First bloom.	First ripe fruit.	Productiveness, Scale, 1 to 10.	Remarks.
1	Auburn.....	N. Y.....	1890	May 24..	July 15..	1	The correct name unknown.
2	Golden (Golden Prolific).....	N. Y.....	1890	" 15..	" 15..	0	Quite liable to mildew.
3	Industry.....	Eng.....	1889	" 12..	July 14..	1	Mildews, unless sprayed.
4	Orange (Early Orange).....	N. Y.....	1890	" 12..	" 15..	0	Mildews, unless sprayed.
5	Pearl.....	Ont.....	1890	" 9..	" 17..	8	Very promising.
6	Oregon (now named Apex).....	Oregon.....	1892	" 9..	" 17..	8	Not yet fruited.
7	Triumph.....	N. J.....	1891	May 10..	July 19..	0	Objectionable name.

3. SMOOTH GOOSEBERRY—(*Ribes hirtellum*).

Number.	Name.	Origin.	Planted.	First bloom.	First ripe fruit.	Productiveness, Scale, 1 to 10.	Remarks.
1	Champion.....	Ohio.....	1888	May 10..	July 15..	0	Strong; healthy; unproductive.
2	Houghton.....	N. E.....	1883	" 12..	" 17..	5	Hardy; very productive.
3	Pale Red.....	Am.....	1890	" 10..	" 17..	6	Nearly identical with Houghton

Downing is a strong grower, with stout, very thorny shoots. Fruit large, round, green when mature. Popular in the market.

Smith is not a vigorous plant; very thorny. Fruit large, greenish-yellow, oval; of superior quality.

Mountain is a strong grower and free from mildew. Fruit large, but variable in size; poor in quality. Worthless.

Auburn is of European type, a moderate grower; has not mildewed here. Fruit large, light red when mature. The true name is unknown.

Golden (Golden Prolific), Orange (Early Orange), and Pearl are American seedlings of the European type. Industry is an importation from England. They are all more or less liable to mildew here, requiring occasional spraying to maintain their health in this climate.

Triumph, received from New Jersey, and Oregon (now named Apex) from the Pacific coast, received but recently, are understood to be American seedlings, the former of the European and the latter of the Pacific coast type.

Champion, although vigorous and apparently mildew proof, is so unproductive and the fruit so small and poor as to render it practically worthless.

Houghton and Pale Red are much alike. Both are hardy, productive, and mostly free from mildew. They will bear neglect better than most varieties. Fruit small.

CHERRIES (*Prunus*).

Probably few, if any, species of fruit trees are as impatient of excessive moisture in the soil as are the cherries. In their case the injury from the copious and long continued rains of the spring and early summer of last year has proved more serious than was apparent during that season, since quite a number of trees have this season shown indications of injury obviously attributable to that cause.

A large number of varieties have bloomed and fruited this season, but most of them so sparsely that, on account of the depredations of birds in many cases, it has been difficult to accurately determine the date of ripening.

The cherry plantations were included in the spraying given the entire plantation in November, 1892.

April 10 and 11 cherries were sprayed with diluted Bordeaux, using 4 pounds copper sulphate, 3 pounds lime, and  $2\frac{1}{2}$  ounces Paris green, in 32 gallons of water.

On June 8 they received the second spray this season, using 4 pounds copper sulphate, 3 pounds lime and  $2\frac{1}{2}$  ounces of Paris green, in 32 gallons of water.

On June 27 they were treated with kerosene emulsion to extirpate the slug (*Eriocampa cerasi*).

On July 7, the pest having reappeared the trees were treated with the extract of tobacco stems, after which further treatment for this insect was not found necessary.

On July 14 and 15, cherries received a final treatment, consisting of 2 pounds copper sulphate,  $1\frac{1}{2}$  pounds lime, and  $2\frac{1}{2}$  ounces Paris green, in 32 gallons water.

The slug (*Eriocampa cerasi*) has been much less troublesome this year than formerly, yielding readily to the sprays given as stated.

No other insects have proved troublesome upon the cherry, the curculio apparently confining operations to adjacent rows of plums and peaches.

No attacks of fungi have been noticed, except as the cause of premature loss of foliage by a few of the injured trees already mentioned.

Experience has shown that the Mazzard or sweet cherries (and to a slight extent the Dukes also) when grown rapidly, as under thorough cultivation they usually do in our Michigan soil and climate, are often seriously if not even fatally injured during subsequent severe winters, and when branched as high as is generally done they are liable to what is known as "bark-burst" during severe cold in winter, followed by death after a very few years of decrepitude and disease.

No remedy has yet been discovered for such conditions. Prevention is, so far as known, the sole alternative. This may be accomplished by giving only so much manure and cultivation while the tree is still young as shall produce only moderate, healthy growth and partially or wholly omitting cultivation thereafter; also branching them so low that the trunk and larger branches, in which, if at all, bursting is likely to occur, shall be well shaded from the influence of the mid-day sun, by the foliage.

Under such conditions trees of these species may be reasonably expected to reach mature age in sound condition, while under opposite conditions

they would be in danger of perishing even when scarcely yet in full bearing.

In the following tabulation the arrangement of last year, placing Heart and Bigarreau cherries together in one class and Dukes and Morellos in another, is continued.

1. HEART AND BIGARREAU CHERRIES—(*Prunus avium*).

Number.	Name.	Class.	Origin.	Planted.	First bloom.	First ripe fruit.	Remarks.
1	Bigarreau (Yellow Spanish)	Big. ....	Eur. ....	1890	May 20 ..	July 10 ..	Type of the Bigarreau class.
2	Cleveland .....	Big. ....	Ohio ....	1890	" 18 ..	.....	Originated by the late Dr. Kirtland.
3	Downer .....	Heart...	Mass. ....	1888	" 15 ..	July 4 ..	Profitable for market.
4	Eagle (Black Eagle) .....	Heart...	Eng. ....	1888	" 18 ..	" 7 ..	Old. Excellent.
5	Elton .....	Big. ....	Eur. ....	1890	" 18 ..	.....	Yellow, with a red cheek.
6	Florence .....	Big. ....	Italy ....	1891	.....	.....	Has not yet fruited.
7	Knight (Knight's Early) .....	Heart...	Eng. ....	1890	May 19 ..	.....	An excellent early cherry.
8	La Maurie (Early Lamaurie) .....	Heart...	Eur. ....	1892	.....	.....	Not yet tested.
9	Mary (Kirtland's Mary) .....	Big. ....	Ohio ....	1890	May 19 ..	.....	A seedling of Dr. Kirtland.
10	Mezel .....	Big. ....	Eur. ....	1890	" 20 ..	.....	Large. Popular in Europe.
11	Napoleon .....	Big. ....	Eur. ....	1892	" 19 ..	.....	Very firm. Fine market cherry.
12	Ohio (Ohio Beauty) .....	Heart...	Ohio ....	1890	" 19 ..	.....	A fine variety from Ohio.
13	Purity .....	.....	.....	1891	.....	.....	Yet untested.
14	Purple (Early Purple) .....	Heart...	Eur. ? ..	1891	May 22 ..	.....	The earliest of the older cherries.
15	Rockport .....	Big. ....	Ohio ....	1890	" 18 ..	.....	Popular.
16	Tartarian (Blk. Tartarian) ..	Heart...	Eur. ....	1888	" 17 ..	.....	Large. Tree upright, vigorous.
17	Transparent (Coe's Trans- parent) .....	Heart...	Conn. ....	1888	" 17 ..	.....	One of the most beautiful.
18	Windsor .....	Big. ....	Ont. ....	1890	" 18 ..	.....	New, late, promising.
19	Wood (Gov. Wood) .....	Heart...	Ohio ....	1890	" 18 ..	.....	A popular market variety

2. DUKES AND MORELLOS—(*Prunus cerasus*).

Number.	Name.	Class.	Origin.	Planted.	First bloom.	First ripe fruit.	Remarks.
1	Abbees (Oignies) .....	Morello.	Europe.	1888	May 18.	July 12.	A slender grower. Late.
2	Angouleme .....	Duke?	"	1888	" 21.	"	Vigorous. Promising.
3	Baender .....	Morello.	"	1892	" 20.	"	Not yet fruited.
4	Bessarabian .....	"	"	1888	" 17.	July 8.	Imported by Prof. Budd.
5	Brusseler (Braune) .....	"	"	1888	" 20.	"	of Iowa. Imported by Prof. Budd.
6	Carnation .....	Duke	"	1890	" 18.	"	of Iowa. Needs further trial.
7	Choisy .....	"	"	1888	" 20.	July 5.	Beautiful. Excellent.
8	Du Nord (Griotte du Nord) ..	Morello.	"	1888	" 22.	"	Amateur. Imported by Prof. Budd.
9	Dyehouse .....	"	Am.	1890	" 19.	"	of Iowa. Very early. Slender.
10	Eugenie .....	Duke	France	1888	" 6.	July 6.	drooping. Comparatively new.
11	Everbearing .....	Morello.	Am.	1892	" 22.	"	Promising.
12	Fraendorfor (Weichsel) .....	"	Europe.	1888	" 18.	July 8.	Yet untested.
13	Galopin .....	"	"	1892	"	"	Late. Very acid.
14	Glass (George Glasskirche) ..	Duke?	Europe.	1888	May 22.	July 1.	Not bloomed or fruited.
15	Hortense .....	"	France	1888	" 16.	" 6.	As importation by Prof. Budd.
16	King (Amarelle) .....	Morello.	Europe.	1892	"	"	One of the largest of the Dukes.
17	Late Duke .....	Duke	"	1890	May 20.	"	Only tested as to growth.
18	Lithauer (Weichsel) .....	Morello.	Europe.	1892	"	"	Old, but little known.
19	Louis (Phillippe) .....	"	"	1888	May 15.	July 5.	Has not shown bloom or fruit.
20	Lutovka .....	"	"	1888	" 17.	"	Late. Good. Lacks productiveness.
21	Magnifique .....	Duke	"	1888	" 20.	July 31.	Promising.
22	Mahaleb .....	Mahaleb	"	1892	"	"	A fine late variety.
23	May Duke .....	Duke	"	1888	May 18.	July 6.	Used only as a stock.
24	Minnesota (Ostheim) .....	Morello.	Am.	1892	" 19.	" 10.	The type of the class.
25	Montmorency .....	"	Europe.	1888	" 20.	" 5.	Requires further trial.
26	Montmorency (Large) .....	"	"	1890	" 19.	"	Probably Mont. Ordinaire.
27	Montmorency (Ordinaire) ..	"	"	1890	" 22.	"	Fruit destroyed by birds.
28	Montreuil .....	Duke	"	1890	" 20.	"	Fruit destroyed by birds.
29	Olivet .....	"	"	1892	" 20.	"	Very promising.
30	Ostheim .....	Morello.	Europe.	1888	" 18.	"	But partially tested.
31	Ostheimer .....	"	"	1892	" 24.	"	Requires longer trial.
32	Richmond (Ey. Richmond) ..	"	"	1888	" 22.	July 1.	Not yet fruited.
33	Royal Duke .....	Duke	"	1890	" 20.	"	Most popular for market.
34	Sklanka .....	Morello.	"	1888	" 20.	July 4.	Old, but little known.
35	Spaté (Amarelle) .....	"	"	1888	" 22.	"	Imported by Prof. Budd.
36	Strauss (Weichsel) .....	"	"	1888	" 18.	"	Imported by Prof. Budd.
37	Suda .....	"	"	1892	" 22.	"	Not yet well tested.
38	Twenty-five (Orel) .....	"	Europe.	1892	" 22.	"	Not yet well tested.
39	Twenty-seven (Orel) .....	"	"	1892	"	"	Not yet well tested.
40	Weir 2 .....	"	Ill.	1892	May 22.	"	Not yet well tested.
41	Wragg .....	"	Iowa	1891	" 27.	"	A slender grower. Late.
							Acid.

## SWEET CHERRIES.

Purple (Early Purple), nearly black when fully ripe, is the earliest well tested cherry, of fair size and good quality, with the possible exception of La Maurie (Early Lamaurie), which has not yet fruited here.

Knight (Knight's Early), Eagle (Black Eagle), superior in quality, and Tartarian (Black Tartarian), valued for market, are among the most popular dark colored cherries.

Of light colored varieties, Transparent (Coe) is excellent and very beautiful, while Cleveland, Elton, Wood (Gov. Wood), Napoleon, and Rockport are firm, good handlers and, for that reason, adapted to marketing.

Bigarreau (Yellow Spanish) is the best of the light colored, firm fleshed varieties, but, unfortunately, it is liable to crack and decay before ripening, during warm, wet weather.

Downer, though less firm, is hardy, rather late, very productive, large, of rich color, profitable.

Windsor is newly introduced; said to ripen quite late. It is highly commended by those who have fruited it.

#### THE DUKES.

Intermediate between the sweet cherries and the Morellos, so far as vigor of growth and acidity of fruit are concerned.

Choisy (Belle de Choisy) is exceedingly beautiful and of mild flavor, and, in the opinion of many, unexcelled in any class. Unfortunately it lacks productiveness.

Eugenie, Hortense (one of the largest Dukes), Magnifique (very late), May Duke (the type of the class), Olivet. and Montreuil (comparatively new varieties), are all worthy of greater attention than they generally receive.

Royal Duke and Late Duke are old varieties though, so far as known, not yet thoroughly tested in this state.

#### MORELLOS.

There appear to be several more or less distinct races which, among Europeans, appear to have been sub-classified accordingly. In this country, so far, such sub-classification has not received attention.

Dyehouse is a very spreading and even drooping grower and, so far, has been the first to ripen.

Richmond (Early Richmond) is so well known as a popular market variety that extended notice seems unnecessary. In season it closely follows the foregoing.

Louis (Phillippe) is large, late, and excellent for culinary purposes, but is slightly lacking in productiveness.

Wragg is valued at the west for its hardness. It is late, nearly black, and quite acid. The tree is a slender, spreading grower.

Montmorency (see table) is probably identical with Montmorency Ordinaire.

Of the remaining varieties of Morello, a considerable number have now fruited; several of them, apparently, are quite late. Further trial is needful to determine their comparative values.

#### MULBERRIES (*Morus*).

This, in one or more species, occurs, though rarely, in the forests of this state, occasionally as a tree of considerable size.

The varieties grown at this station, however, are imported, being of such as have become improved and taken on the habit of maturing their fruits in succession through a considerable period.

Downing is an American seedling of this character from *Multicaulis*

(*M. alba*). In severe winters it is occasionally injured, even in southern Michigan.

New American and Hicks also have this habit, with apparently superior hardiness.

Russian (*M. Siberica* of nursery catalogues) is abundantly hardy here, though of no value so far as fruit is concerned.

Tea's Weeping, when grafted high on upright growing stocks, makes a beautiful lawn tree. The foliage is glossy and beautiful, much superior to that of Kilmarnock willow, long popular as a weeping lawn tree.

PEACHES (*Prunus Persica*, *Amygdalus Persica*, or *Persica Vulgaris* of various botanists).

The trees of this species upon the station grounds received a spray of Bordeaux of the usual strength after the leaves had fallen last autumn.

April 10 and 11, 1893, they were again sprayed, using 4 lbs. of copper sulphate, 3 lbs. of lime, and  $2\frac{1}{2}$  oz. of Paris green in 32 gallons of water.

June 8-12, the spray was repeated, using the same mixture.

June 29 they were again sprayed, using modified Eau Celeste. (Two lbs. of copper sulphate,  $1\frac{1}{2}$  lbs. of carbonate of soda, and 1 qt. of ammonia water in 32 gallons of water.)

July 14 to 15 a final spray was given, using 2 lbs. copper sulphate,  $1\frac{1}{2}$  lbs. lime, and  $2\frac{1}{2}$  oz. Paris green in 32 gallons water.

This last spray caused considerable loss of the older foliage, leaving that near the extremities of the young shoots in all cases apparently unaffected.

As the apparent result of the first two sprayings mentioned, there has been an almost total absence of "leaf curl" (*Taphrina deformans*) which is usually quite prevalent here in early spring and which was present this year in neighboring orchards, causing many of the leaves and fruits to drop.

Apparently also the fungus which usually, in this climate, attacks the foliage and growing twigs of the serrate varieties of the peach, has been subdued by these applications, since a single serrate variety growing here, which has been annually very severely attacked by this fungus, has this season almost wholly escaped, making sound, healthy growth as in the case of other varieties.

The only insects which have proved troublesome are the curculio, for whose attacks jarring has been the remedy employed, and the borer (*Sannina exitiosa*) to remove which the trees were "wormed" in September—a process intended to be repeated in April or May next.

For more convenient reference all abbreviations are inserted at the head of the columns in which they are used.

In very many cases the *origin* of a variety is unknown or uncertain, for which reason in most cases the source from which the variety was received is inserted instead of the place of origin.

The word "cling" is appended to the names of varieties of that class, and in a few cases only the word "free" is appended to the name to avoid uncertainty. In all other cases the word "free" is to be understood, the column usually devoted to this particular being omitted as unnecessary.

In many cases names are simplified or objectionable portions enclosed in parentheses to indicate probable future elisions in compliance with the rules of modern nomenclature.

## PEACHES.

Number.	Name.	Origin.	Planted.	Flowers, l. large; s. small.	Glands, s. serrate; g. globose; r. reniform.	First bloom.	First ripe fruit.	Color, w. white; y. yellow; r. red.	Flesh, p. pale; y. yellow.	Flavor, s. sweet; v. vinous; a. acid.	Remarks.
1	Adrian .....	Mo. ....	1892	---	g						
2	Alexander .....	Ill. ....	1892	---	g			w r	p	v	A partial cling.
3	Allen .....	Mo. ....	1891	s	r	May 22					
4	Alpha .....	Mo. ....	1891	r	r						
5	Amelia .....	Mo. ....	1890	l	r	" 22					Of Carolina.
6	Amsden .....	Mich. ....	1891	l	g	" 22		w r	p	v	A partial cling.
7	Andrews (Mammoth) .....	Mo. ....	1892	---	r						
8	Barber .....	Mich. ....	1892	---	r						
9	Barnard .....	Mich. ....	1888	s	r	" 22	Sept. 11	y r	y	s	For market only.
10	Beers (Smock) .....	Mo. ....	1890	s	r	" 22					
11	Belle .....	Mich. ....	1891	---	g						
12	Bell (Favorite) .....	Del. ....	1890	s	r	" 24					Distinct from Belle.
13	Bequette Cling .....	Tex. ....	1890	s	r	" 22					
14	Bequette Free .....	Tex. ....	1890	s	r	" 22					
15	Bickell (Late) .....	Del. ....	1890	s	r	" 22	Oct. 30	w r	p	a	May not ripen here.
16	Bishop (Early) .....	Mo. ....	1891	s	g	" 22					
17	Bonanza .....	Mo. ....	1891	s	g	" 22					
18	Boyles .....	Mo. ....	1891	s	g	" 22	Sept. 20				Only a specimen or two.
19	Brandywine .....	N. J. ....	1890	s	g	" 22					
20	Brett (Mrs. Brett) .....	Mo. ....	1890	s	r	" 22					
21	Brigdon .....	N. Y. ....	1890	l	g	" 22	Sept. 20	y r	y	v	Valued for market.
22	Briggs (Gov. Briggs) .....	Tex. ....	1890	s	g	" 24					
23	Bronson .....	Mich. ....	1891	s	r	" 22					
24	Brown (Early) .....	Mich. ....	1892	l	r	" 22					
25	Burke .....	Mich. ....	1892	---	r						
26	Canada (Early Canada) .....	Mich. ....	1892	l	g	" 22					
27	Carolina (Beauty) .....	Mich. ....	1892	---	r						
28	Chair (Choice) .....	Ohio ....	1890	s	r	" 22					
29	Champion (Mich.) .....	Mich. ....	1890	l	s	" 26					
30	Champion (Ohio) .....	Ohio ....	1892	s	g	" 24					
31	Chili (Hill's Chili) .....	Mich. ....	1888	l	r	" 22	Oct. 5	y r	y	s	Comes true from the pit.
32	Chili (Seedling 2) .....	Mich. ....	1888	l	r	" 22	" 7	y r	y	sv	Seedling by C. Engle.
33	Chili (Seedling 3) .....	Mich. ....	1888	---	r		" 7	y r	y	sv	Seedling by C. Engle.
34	Cleffey (Allen) .....	Mich. ....	1892	s	r						
35	Collister (McCollister) .....	Mo. ....	1891	s	r	May 24					
36	Columbia .....	Mo. ....	1891	l	r	" 22					
37	Conkling .....	Mo. ....	1890	l	r	" 22					
38	Coolidge .....	Mich. ....	1892	s	g	" 26		w r	p	v	Old and valued.
39	Corner .....	Mich. ....	1891	s	r	" 22	Oct. 5				An Allegan Co. seedling.
40	Crawford (Early) .....	Mich. ....	1888	s	g	" 22	Sept. 7	y r	y	v	Fruit buds not hardy.
41	Crawford (Seedling 1) .....	Mich. ....	1888	s	g	" 22	" 10	y r	y	v	Seedling by C. Engle.
42	Crawford (Seedling 2) .....	Mich. ....	1888	s	g	" 22	" 14	y r	y	v	Seedling by C. Engle.
43	Crosby .....	Mass. ....	1892	s	r	" 29					
44	Crothers .....	Tex. ....	1891	s	g	" 22	Oct. 9				Quality good here.
45	Cuba (Dwarf Cuba) .....	Mich. ....	1892	---	r						
46	Dennis .....	Mich. ....	1891	l	g	" 22					
47	Diamond .....	Ohio ....	1892	s	g	" 27					
48	Druid Hill .....	N. Y. ....	1891	s	g	" 22					
49	Dunlap .....	Mich. ....	1892	s	r	" 29					
50	Early York (Large) .....	Mich. ....	1892	s	g			w r	p	sv	Old, popular, market.
51	Ede (Capt. Ede) .....	Mich. ....	1890	s	r	May 22					
52	Elberta .....	Tex. ....	1890	s	r	" 22					
53	Eldred Cling .....	Mo. ....	1891	l	g	" 20	Aug. 30				
54	Elthson .....	Ohio ....	1889	s	r	" 23	Oct. 9	y r	y	sv	A promising market variety.
55	Engle (Mammoth) .....	Mich. ....	1891	s	g	" 22	Sept. 20	y r	y	v	Promising for market.
56	Foster .....	Mich. ....	1888	s	g	" 22	" 9	y r	y	v	Large and showy.
57	Fox .....	Mo. ....	1891	s	g	" 22	Oct. 9				

## PEACHES—CONTINUED.

Number.	Name.	Origin.	Planted.	Flowers, l. large; s. small.	Glands, s. serrate; g. globose; r. reniform.	First bloom.	First ripe fruit.	Color, w. white; y. yellow; r. red.	Flesh, p. pale; y. yellow.	Flavor, s. sweet; v. vinous; a. acid.	Remarks.
58	Future Great.....	Mo. ....	1891	---	g						
59	Garfield.....	Mich. ....	1892	---	g						
60	Gem Cling.....	Tex. ....	1890	s	r	May 22					
61	George IV. (George the Fourth).....	N. Y. ....	1888	s	g	" 22	Sept. 6	w r	p	s v	An amateur variety. Unproductive so far.
62	Globe.....	N. J. ....	1888	s	g	" 22	29	w r	p	v	
63	Gold Drop (Golden Drop).....	Mich. ....	1890	l	r	" 22		y	y	s	Probably an old variety.
64	Good.....	N. J. ....	1890	s	g	" 22					
65	Grant (Gen. Grant).....	Mo. ....	1892	---	r	" 26					
66	Great Western.....	Mo. ....	1892	---	r	" 22	Oct. 17	w r	p	v	Late, promising.
67	Gudgeon (Late).....	Mo. ....	1891	s	r	" 22					
68	Hale.....	Mich. ....	1888	l	g	" 22	Ang. 14	w r	p	v	Best and latest of the half clings.
69	Hale Oblong.....	Mich. ....	1888	l	g	" 22	" 18	w r	p	v	Seedling of C. Engle.
70	Hale Round.....	Mich. ....	1888	l	g	" 22	" 18	w r	p	v	Seedling of C. Engle.
71	Hance Golden.....	N. J. ....	1890	s	g	" 22					
72	Hance Smock.....	Del. ....	1890	s	r	" 22	Oct. 16	w r	p	v	Only one or two specimens. Promising.
73	Haas (John Haas).....	Del. ....	1890	l	r	" 22	Aug. 30	w r	p	v	
74	Heath Cling.....	Del. ....	1890	s	g	" 22					
75	Hinman.....	Mo. ....	1891	l	r	" 22					
76	H. No. 34.....	N. Y. ....	1890	---							
77	Hold On (Geary's).....	Mo. ....	1890	s	r	" 22	Oct. 12				
78	Hughes (IXL).....	Mo. ....	1892	---	r	" 22					
79	Husted.....	Mich. ....	1891	l	r	" 22	Sept. 4	w r	p	v	
80	Hyatt.....	N. J. ....	1888	l	g	" 22	Aug. 23	w r	p	v	Finer than Hale.
81	Infant (Wonder).....	Mo. ....	1892	s	g	" 24					
82	Ingold (Lady Ingold).....	Mo. ....	1892	---	g	" 22					
83	Jacques.....	Mo. ....	1892	s	r	" 24					
84	Jacques Late.....	Mo. ....	1892	s	g	" 22					
85	Jones.....	Mo. ....	1882	s	g	" 24					
86	June Rose.....	Tex. ....	1890	l	g	" 22	Sept. 16	w r	p	s v	Promising.
87	Kalamazoo.....	Mich. ....	1890	s	r	" 22	Oct. 2	y	y	s v	Profitable for market
88	Kaloola.....	N. J. ....	1892	---	g	" 22					
89	Kevitt Cling (McKevitt Cling).....	Mo. ....	1892	---	g	" 22					
90	Late Barnard.....	Mich. ....	1892	s	r	" 22					
91	Late Snow (Snow's Late).....	Ohio ....	1890	s	r	" 22	Sept. 20	y r	y	s	Promising.
92	Late White.....	Mich. ....	1888	s	r	" 22	Oct. 7	w r	p	v	Seedling of C. Engle.
93	Lemon Cling.....	N. J. ....	1888	s	g	" 22	Sept. 25	y r	y	s v	An excellent cling.
94	Lewis.....	Mich. ....	1891	l	r	" 22	" 8				
95	Lock Cling.....	Mo. ....	1892	s	r	" 22					
96	Louise (Early Louise).....	Mich. ....	1891	l	r	" 22					
97	Love All.....	Mo. ....	1892	s	g	" 24					
98	Lovett (White).....	N. J. ....	1890	s	r	" 22					
99	Magdala.....	N. Y. ....	1890	s	r	" 22					
100	Mammoth Heath.....	Mo. ....	1892	l	r	" 22					
101	Marshall (Marshall's Late).....	Ohio ....	1890	s	r	" 22					
102	Marshall Neil.....	Mo. ....	1892	l	r	" 24					
103	Milhizer.....	Mo. ....	1892	s	g	" 24					
104	Minnie.....	Tex. ....	1890	s	r	" 22					
105	Missouri (Blood Leaf).....	Mo. ....	1892	---	r	" 22					
106	Moore (Moore's Fav.).....	N. J. ....	1890	s	g	" 22	" 18	w r	p	v	Promising.
107	Morris County (Rareripec).....	Del. ....	1890	s	r	" 22	Oct. 20				
108	Morris White.....	Mich. ....	1888	s	r	" 22	Sept. 29	w	p	v	Valued for canning.
109	Mountain Rose.....	Mich. ....	1888	s	g	" 22	" 4	w r	p	s v	Profitable.
110	Muir.....	N. J. ....	1890	s	r	" 24					
111	Murat.....	Mich. ....	1889	---							
112	Mystery (Yellow Mystery).....	N. J. ....	1888	s	r	" 22	" 14	y r	y	v	Beautiful and good.
113	N. Amer. Apricot.....	Mo. ....	1892	---	r						

## PEACHES--CONTINUED.

Number.	Name.	Origin.	Planted.	Flowers, s. small.	L. large; s. small.	Glands, s. serrate; g. reniform.	First bloom.	First ripe fruit.	Color. w. white; y. yellow; r. red.	Flesh. p. pale; y. yellow.	Flavor. s. sweet; v. vinous; a. acid.	Remarks.
114	Nectarine	N. Y.	1889	l	r		May 22	Oct. 7	w r	p	v	Beautiful, English.
115	Need (Need's Barnard)	Mo.	1892	s	r		" 22	" 22				
116	No. 34 H.	N. Y.	1890	l	r		" 22	Sept. 18	y	y	s	A yellow market peach.
117	Normand (Choice)	Mich.	1892	s	r		" 22	Oct. 14	w r	p	v	Popular for a cling.
118	Oldmixon Cling	Mich.	1888	s	g		" 22	Oct. 14	w r	p	v	
119	Ostrander (Early)	Mich.	1892	---	g							
120	Palmerston (Lord Palmerston)	N. Y.	1890	l	g		" 22					
121	Pansy	Tex.	1890	s	r		" 22					
122	Pearl	Mich.	1889	---	g		" 22	Sept. 25	w r	p	v	Seedling by C. Engle.
123	Picket (Late)	Mo.	1890	s	r		" 22	Oct. 18				
124	Pratt	N. Y.	1890	s	r		" 22	Sept. 13	y r	y	v	Promising.
125	Prince (Prince's Rareripe)	Del.	1890	s	g		" 22					
126	Princess (of Wales)	N. Y.	1889	l	g		" 22					
127	Prize	Mo.	1892	---	g		" 22					
128	Prize 1	Del.	1890	s	g		" 22					
129	Reed (Golden)	N. J.	1890	s	g		" 24					
130	Reeves (Favorite)	Mo.	1890	s	g		" 22					
131	Ringold	Tex.	1890	---	r		" 22					
132	River Bank	Mo.	1892	l	g		" 22					
133	Rivers (Early Rivers)	N. Y.	1888	l	r		" 22	Aug. 14	w r	p	v	Excellent for home use.
134	Rivers York (Riv. Ey. Yk.)	N. Y.	1890	l	g		" 22					
135	Roser	Mo.	1892	l	r		" 22					
136	Roseville Cling	Mo.	1892	l	g		" 22					
137	R. S. Stevens	N. Y.	1891	s	r		" 23					
138	Saint John	Del.	1890	s	r		" 22	Sept. 11	y r	y	s	Has many names.
139	Salway	Mo.	1890	s	r		" 22	Oct. 30	w r	p	v	Best very late.
140	Scott (Nonpareil)	Ohio	1890	s	g		" 20					
141	Sener	N. J.	1888	s	r		" 22					
142	Shipley	Mo.	1892	s	g		" 22					
143	Shipley Late	N. J.	1890	l	r		" 22					
144	Silver (Early Silver)	N. Y.	1888	l	r		" 22	Sept. 10	---	---	---	Pure white to the pit.
145	Smock Free	Mich.	1888	s	r		" 20	Oct. 27	y r	y	v	A standard late peach.
146	Smock X	Mo.	1892	---	r		" 22					
147	Southern Early	N. J.	1890	s	r		" 22					
148	Stark Heath	Mo.	1892	s	r		" 22					
149	Steady	Mo.	1888	s	r		" 22	" 10	---	---	---	So far unproductive.
150	Stevens' Late	Del.	1890	s	r		" 22	" 17	---	---	---	Of doubtful value here.
151	Stevens' Rareripe	Del.	1890	s	r		" 22					
152	Strong (Mammoth)	Mo.	1892	s	g		" 22					
153	Stump (the World)	Mo.	1890	s	g		" 23					
154	Superb Cling	Mo.	1892	---	r		" 22					
155	Surpasee (Melocoton)	N. Y.	1890	s	r		" 23					
156	Surprise (Hynes)	Tex.	1890	l	g		" 22	Aug. 28	w r	p	v	Promising.
157	Switzerland	Mich.	1891	s	g		" 22					
158	Toquin	Mich.	1892	l	r		" 22	Sept. 19	y	y	s v	A market variety.
159	Townsend	Mo.	1892	s	g		" 22					
160	Troth (Early)	Mich.	1888	s	g		" 22					A market variety.
161	Tuscany (Hardy Tuscany)	Mo.	1892	---	r		" 22					
162	Wager	Del.	1890	l	r		" 22	Oct. 7	---	---	---	Variety incorrect.
163	Walker	Mo.	1892	s	g		" 22					
164	Walker Variegated	Mo.	1890	s	g		" 22					
165	Waterloo	N. Y.	1888	l	r		" 22	Aug. 4	w r	p	v	Very early, promising.
166	Wheatland	N. Y.	1888	s	g		" 22	Sept. 18	w r	p	v	Desirable if productive.
167	Williamson (Choice)	Mich.	1892	s	g		" 22					
168	Worthen (Jennie Worthen)	Tex.	1890	s	r		" 22	" 20	y r	y	s	Promising.
169	Wonderful	Mich.	1890	s	r		" 23	Oct. 24	y r	y	v	Of uncertain value.
170	Yellow Rareripe	Mich.	1888	s	g		" 22	Sept. 13	y r	y	v	Several varieties so named.

## NECTARINES.

Botanists class these with peaches, the chief difference being in their smooth skins.

Number.	Name.	Origin.	Planted.	Flowers, l, large; s, small.	Glands, s, serrate; g, globose; r, reniform.	First bloom.	First ripe fruit.	Color, w, white; y, yellow; r, red.	Flesh, p, pale; v, yellow.	Flavor, s, sweet; v, vinous; a, acid.	Remarks.
1 2	Pitmaston (Orange)..... Unnamed seedling.....	Mich..... Mich.....	1892 1888	s	r	May 22	Sept. 12	w r	p	v	May prove desirable.

Very many of these tabulated varieties are but imperfectly tested here and are included to afford at least a partial means of identification through the flowers and leaf glands.

Short notices are given of the more desirable varieties whether for market or domestic purposes.

Barnard, Chili (Hill's Chili), Gold Drop, Gudgeon (Late), Hale, Kalamazoo, Mountain Rose, Stump (the World), and Salway (very late), are each and all more or less popular as market varieties.

In addition to these, Crawford (Early and Late), Foster, Oldmixon Free, and Smock Free are only less valued for such purpose on account of greater liability to the winter-killing of the fruit buds.

The delicate texture of many varieties to some extent unfits them to endure the rough treatment to which commercial varieties are usually subjected, while for this peculiarity they become the more desirable for home uses. Among such are the Crawfords (Early and Late), Foster, George IV, Hale, Rivers (Early), Surprise (Hynes), and Waterloo.

The very early varieties, Alexander, Amsden, Waterloo, and others, which with their typical parent, the Hale, are known as semi-clings, are quite inclined to rot before ripening. Still, if planted in an airy location, a few may prove desirable, at least in the home plantation.

Surprise (Hynes) obviously is one of this class, coming from Texas. A longer trial is needful to determine its value here.

Brigdon comes from central New York where it is deemed valuable for the market. It first fruited here this season.

Two seedlings of Chili (Hill's Chili), by C. Engle of Paw Paw, which have produced fine crops here this season, are slightly later than the parent, more highly colored, and of finer flavor.

The same is true of two Crawford (Early) seedlings from the same source, at least one of which promises well as a market variety.

Engle (Mammoth), also from the same, has already acquired some reputation as a market variety.

Hyatt and two Hale seedlings by Engle have produced fine, large crops of fruit; a little earlier, larger, more highly colored, and less "clingy" than Hale. They give indications of value for both amateur and market purposes.

Morris White and Silver (Early Silver) are heavy bearers with clear,

white flesh, not colored at the pit, and for that reason especially desirable for canning or preserving.

Ellison has borne a fine crop; fruit yellow, a good handler, and promising for the market.

Toquin, originating in the town of that name, and also a variety received for trial from New York with the cabalistic cognomen, "No. 34 H." have borne a few specimens each giving indications of adaptation to the market.

Wonderful, with a name apparently devised to promote sales, has borne a few specimens which prove wonderful, if at all, from their failure to justify the name.

A very considerable number of others have shown more or less fruit, but in most cases not sufficient to warrant an opinion as to their probable value.

#### GRAPES (*Vitis*).

With the exception of the very severe drouth of the past summer and early autumn, the season has been favorable for the grape.

The rose chafer (*Macrodactylus subspinosus*), although very numerous on a number of plum trees on light soil, has, this season, been very rare upon the grape. A few grapevine flea beetles, (*Graptodera chalybea*), have been found, but not in considerable numbers.

Of fungi, powdery mildew, and anthracnose, (*Spaceloma ampelinum*), have been somewhat troublesome, although almost wholly confined to varieties hybridized with *V. vinifera*.

The grapes, in common with the entire plantation, received a spray of Bordeaux mixture, of the usual strength, after pruning in the autumn of 1892, for the destruction of the resting spores of fungi.

Prior to the commencement of operations for the current year, plants were reserved as the basis of a set of experiments in the use of a variety of mixtures as preventives or remedies for fungi, as follows:

Of Moore's Early, Salem, Ulster, and Wyoming, five sets, of two plants each.

Of Brighton, six sets, of three plants each.

Of Concord and Niagara, six sets, of two plants each.

Of each variety, the first set was left unsprayed, as a means of comparison.

The second set of each of the four first named varieties was sprayed four times, on April 15, May 25, June 20, and July 10, with  $\frac{1}{2}$  lb. copper sulphate, 1 lb. carbonate of ammonia, in 32 gallons water.

The third set of the same received four sprayings on or near the same dates, with ammoniated copper carbonate in 32 gallons water.

The fourth set was sprayed at above dates, with modified Eau Celeste.

The fifth received a spray at same four dates with 1 lb. copper sulphate,  $\frac{3}{4}$  lb. stone lime, in 50 gallons water.

Upon examination made at the close of the growing season, upon the scale of 1 to 10:

Moore's (Early) -----	No. 1 ranked 1	Wyoming -----	No. 1 ranked 2
" -----	" 2 " 3	" -----	" 2 " 1
" -----	" 3 " 4	" -----	" 3 " 3
" -----	" 4 " 4	" -----	" 4 " 1
" -----	" 5 " 2	" -----	" 5 " 1
Ulster -----	" 1 " 3	Salem -----	" 1 " 1
" -----	" 2 " 5	" -----	" 2 " 2
" -----	" 3 " 3	" -----	" 3 " 3
" -----	" 4 " 3	" -----	" 4 " 1
" -----	" 5 " 3	" -----	" 5 " 2

Of Brighton, Concord, and Niagara, also, the first sets were not sprayed. The second sets were sprayed but once, and that before growth commenced.

The third sets were sprayed once only, and that soon after blooming.

The fourth sets were sprayed on April 14, and again on June 15, using 4 lbs. copper sulphate, 3 lbs. stone lime, in 22 gallons water.

The fifth sets received three sprayings of the same on April 14, June 1, and July 1.

The sixth sets were sprayed four times with the same on April 14, May 27, June 20, and July 10.

Brighton -----	" 1 " 6	Niagara -----	" 1 " 2
" -----	" 2 " 5	" -----	" 2 " 2
" -----	" 3 " 4	" -----	" 3 " 1
" -----	" 4 " 3	" -----	" 4 " 2
" -----	" 5 " 2	" -----	" 5 " 4
" -----	" 6 " 1	" -----	" 6 " 2
Concord -----	" 1 " 2		
" -----	" 2 " 1		
" -----	" 3 " 1		
" -----	" 4 " 1		
" -----	" 5 " 1		
" -----	" 6 " 1		

In all these cases the defects were mainly in foliage rather than fruit.

The annual pruning of grapes having been completed, and the cuttings and fallen foliage removed and burned, on November 9 and 10, a thorough spray was given them for the purpose of destroying the spores of fungi.

It is clearly true that, in the interest of pomological accuracy as well as brevity, the use of numbers, whether in connection with names of fruits or otherwise, should never have been tolerated, and should be discouraged and abandoned, notwithstanding the fact that very many otherwise critical and careful pomologists still indulge in their use. In the interest of reform therefore, in this report, numbers attached to names are omitted, save in the case of trial varieties not yet offered to the public, and which have not yet established their right to receive a name.

Short notices are appended of several desirable, well-known varieties, also of others, less generally known, and of yet others, comparatively new or yet unIntroduced.

## GRAPES.

Nmmber.	Name.	Origin.	Planted.	Bunch.		Berry.		First bloom.	Ripe.	Quality, 1 to 10.	Product, 1 to 10.	Remarks.
				Size.	Form.	Size.	Form.					
1	Adirondac .....	N. Y.	1890	l	l sh	l	r	June 24	Sep. 10-17	8	8	Plant of uncertain identity.
2	Agawam .....	Mass.	1888	l	l sh	l	r	" 24	" 17-24	7	8	A long keeper.
3	Aminia .....	Mass.	1888	m	sh	m	r	" 26	" 17-24	8	9	A Rogers' hybrid.
4	August Giant .....	N. Y.	1889	l	sh	l	o	" 26	Oct. 1	5	4	Identity doubtful.
5	Barry .....	Mass.	1888	l	sh	l	r	" 24	Sep. 17-24	6	7	Inclined to mildew.
6	Beagle .....	Texas	1888	m	sh	m	r	" 24	Oct. 5-10	6	7	Of medium quality.
7	Bell .....	Texas	1889	s	s	m	r	" 26	Sep. 17-24	4	4	Trial imperfect.
8	Belvidere .....	Ill.	1890	l	sh	m	r			3	9	Very early.
9	Berckmans .....	S. C.	1891									Not yet fruited here.
10	Black Eagle .....	N. Y.	1890	l	m sh	l	r	June 27	Sep. 10-17	8	9	A wine grape here.
11	Black Pearl .....	Ohio	1890			s	r	" 29	Oct. 3-10			Only a wine grape.
12	Blanco .....	Texas	1889	s		s	r	" 24				Needs further trial.
13	Brighton .....	N. Y.	1888	l	l sh	l	r	" 27	Sep. 17-24	10	7	Requires cross fertilization.
14	Brilliant .....	Texas	1889	s	s	l	r	" 28	" 17-24	3		Mildews badly.
15	Burnett .....	Ont.	1891	l	m sh	l	o					Try further.
16	Cambridge .....	Mass.	1890	l	sh	l	o	June 24	Sep. 10-17	6	8	
17	Campbell .....	Texas	1889			m	r	" 22	" 10-17	5	5	Imperfectly tested.
18	Catawba .....	S. C.	1888	l	sh	m	r	" 27	Oct. 1-8	7	5	Scarcely ripens here.
19	Cayuga .....	N. Y.	1889	s		s	r					Needs a longer trial.
20	Caywood 50 .....	N. Y.	1888	m		l	r	June 21	Sep. 10-17	6	9	Promising for market.
21	Centennial .....	N. Y.	1890	m	m sh	m	r	" 22	" 17-24	9	10	Foliage not healthy.
22	Challenge .....	N. J.	1890	s	sh	m	r	" 21	" 17-24	6	8	Very early.
23	Champion .....	N. Y.	1889	l	sh	m	r	" 24	Aug. 27-	3	8	Almost worthless.
24	Chidester 1 .....	Mich.	1888	m	sh	m	r	" 26	Sep. 10-17	9	3	Good, but unprofitable.
25	Chidester 2 .....	Mich.	1888	m	sh	m	r	" 27	" 17-24	6	8	Promising for market.
26	Chidester 3 .....	Mich.	1892					" 26	" 10-17			First fruited.
27	Chidester 4 .....	Mich.	1892			l	o	" 26	" 27-			
28	Clark .....	Div Pom	1892						Oct. 2	8		Imperfectly tested.
29	Cleaver .....	N. Y.	1890	m	l	s	r		Oct. 3-10	6	7	Cuttings from Div. of Pomology.
30	Clinton .....	N. Y.	1891	s	s sh	s	r	June 21	" 3-10	3	10	Very acid till late.
31	Colerain .....	Ohio	1892									Awaits further trial.
32	Columbia .....	D. C.	1891									Vine a poor grower.
33	Concord .....	Mass.	1888	m	l sh	m	r	June 21	Sep. 24-30	5	9	Standard market grape.
34	Cortland .....	N. Y.	1890	m	l	m		" 21	Aug. 27-			
35	Cottage .....	Mass.	1890	m	l	m	r	" 22	Sep. 10-17	4	8	Very early.
36	Creveling .....	Penn.	1890	l	l	m	r	" 26	" 3-10	8	5	Not valuable.
37	Delaware .....	N. J.	1888	s	sh	s	r	" 22	" 17-24	10	10	Early. Thin bearer.
38	Diamond .....	N. Y.	1889	l	sh	l	r	" 27	" 13-17	8	10	Has few superiors.
39	Diana .....	Mass.	1888	m	m	m	r	" 26	Oct. 8-15	7	7	Amateur and market.
40	Downing .....	N. Y.	1889	l	sh	l	o	" 24	Sep. 24-	8	7	A long keeper. Foxy.
41	Dracut (Amber) .....	Mass.	1890	l	l sh	l	r	" 24	Oct. 1	3	7	Hybrid. Keeps late.
42	Duchess .....	N. Y.	1888	l	l sh	m	o	" 29	Sep. 10-17	3	7	Utterly unworthy.
43	Early Market .....	Texas	1889	s	s	s	r	" 23	" 17-24	10	5	Mildews badly.
44	Early Victor .....	Kan.	1888	m	sh	m	r	" 26	" 10-17	2	2	Not desirable here.
45	Eaton .....	Mass.	1888	l	sh	l	r	" 26	" 3-10	8	7	Promising.
46	Elaine .....	Mich.	1889					" 26	" 17-24	5	8	Showy. Market.
47	El Dorado .....	N. Y.	1889	l	sh	l	r	" 29	" 14-24			C. Engle. Try further.
48	Elvira .....	Mo.	1890	s	s sh	m	r	" 28	" 17-24	8	7	One of Rickett's seedlings.
49	Empire State .....	N. Y.	1888	l	sh	m	o	" 29	" 10-17	7	6	Not valuable here.
50	Eseck .....	Mass.	1889	m	s sh	l	r	" 27	" 17-24	5	6	Excellent. White.
51	Esther .....											Not valuable.
52	Etta .....	Mo.	1890	s	sh	m	r	June 28	Sep. 24-30	2	8	Not yet fruited.
53	Eugenie .....	N. Y.	1891									A wine grape.
54	Enmelan .....	N. Y.	1888	m	sh	sm	r	June 24	Sep. 17-24	7	8	Not yet fruited.

## GRAPES—CONTINUED.

Number.	Name.	Origin.	Planted.	Bunch.		Berry.		First bloom.	Ripe.	Quality, 1 to 10.		Remarks.
				Size.	Form.	Size.	Form.			1 to 10.	Product, 1 to 10.	
55	Eva	Penn.	1889	s	s	m	r	June 24		3		Unworthy.
56	Excelsior	N. Y.	1889	l	sh	l	r		Sep. 6	8		Of doubtful value.
57	Faith	Mo.	1891									Not properly tested.
58	Gaertner	Mass.	1889	m		m l		June 30				Needs longer trial.
59	Geneva	N. Y.	1891					26				Not yet fruited.
60	Goethe	Mass.	1889	m l	sh	l	o	" 28	Oct. 1-8	5		Too late for the north.
61	Golden Drop	N. Y.?	1889	s	s	s	r	" 27	Sep. 10-17	9		Vine unsatisfactory.
62	Golden Gem	N. Y.	1890	s	sh	s	r		24	10		Vine a slow grower.
63	Guinevra	Mich.	1891									C. Engle. Not yet fruited.
64	Hall	Mich.	1893									Not yet fruited.
65	Hartford	Conn.	1889	l	l sh	m	r	June 24	Sep. 10-17	2	10	Too poor. Fruit drops.
66	Hayes	Mass.	1888	m	sh	m	r	" 24	" 10-17	8	9	Excellent. White.
67	Herbert	Mass.	1889	l	m sh	l	r	" 26	" 10-17	7	9	Of fair quality.
68	Highland	N. Y.	1889	l	l sh	l	r	" 30		5	9	Does not ripen here.
69	Honey	Mich.	1891									C. Engle. Further trial.
70	Iona	N. Y.	1888	l	l sh	m	o	June 22	Sep. 17-24	10	5	Best, often fails.
71	Iris	Mich.	1891		sh	l	o	" 22	" 17-24	8		The first fruit.
72	Isabella	S. C.?	1888	l	l sh	l	o	" 24	Oct. 8-15	9	9	Needs a long season.
73	Ives	Ohio	1890	m l	sh	m	o	" 24	Sep. 10-16	4	9	A market grape.
74	Janesville	Wis.?	1889	s	s sh	m	r	" 21	" 27-30	4	10	Hardiness its chief merit.
75	Jefferson	N. Y.	1888	l	sh	m	r	" 29	Oct. 8-15	9	10	A long keeper. Excellent.
76	Jessica	Ont.	1888	s	s	s	r	" 23	Aug. 27-			
77	Jewell	Kan.	1889	m s	s	m s	r	" 27	Sep. 2	10	8	Rich. Early. Seedy.
78	Josselyn 5-2-1	N. Y.	1890	m	m sh	l	r	" 26	Sep. 3-10	8	8	New. Try further.
79	Josselyn 7-2-1	N. Y.	1890						" 17-24	6		Its first fruiting.
80	Josselyn 9-2-1	N. Y.	1890		sh	m	r	June 29	Sep. 24-30	5		Not fruited.
81	Josselyn 10-2-1.	N. Y.	1890									First bearing.
82	Lady	Ohio	1888	m s	s	m l	r	June 27	Sep. 10-17	9	7	Early. Sweet. Rich.
83	Lady Washington	N. Y.	1888	l	sh	m	r	" 27	Oct. 8-15	8	10	Ripens late. White.
84	Leader	Ohio	1890			m	r	" 21		6		But partially tested.
85	Leavenworth	Kan.	1890									Not yet fruited.
86	Lindley	Mass.	1889	m l	sh	l	r	June 27	Sep. 10-17	7		One of the Rogers' hybrids.
87	Lutie	Tenn.	1890	m	s sh	m	r	" 22	" 24-30	2	9	Foxy. Sweet, worthless.
88	Martha	Penn.	1890					" 26				Plant not true to name.
89	Mason	Mich.	1891									A Michigan seedling.
90	Massasoit	Mass.	1888	m	s	m l	r	June 22	Sep. 17-24	8	8	Anthraxose on fruit.
91	Merrimac	Mass.	1888	s	s	l	r	" 24	" 17-24	7	7	A vigorous grower.
92	Michigan	Mich.	1889	s	s	m l	r	" 27	" 10-17	7		Need further trial.
93	Mills	Ont.	1888	l	sh	l	r	" 27	" 17-27	8	9	A long keeper. Fine.
94	Minnesota	Minn.	1890	m	l	m	r	" 24	" 24-30	4	8	Showy. Not valuable.
95	Monroe	N. Y.	1889	m	sh	m	r	" 27	" 17-24	7	9	Seedling of western N. Y.
96	Moore Early	Mass.	1880	m	m	l	r	" 26	Aug. 27-31	4	6	For early market.
97	Moyer	Ont.	1888	s	s sh	m	r	" 27	Sep. 3-10	7	7	Very early. Amateur.
98	Naomi	N. Y.	1889	l	l sh	m	r o	" 29	Oct. 1-8	6	8	Value doubtful.
99	Nectar	N. Y.	1888	l	sh	s	r	July 5	Sep. 10-17	8	2	Unproductive. Poor foliage.
100	Niagara	N. Y.	1888	l	sh	l	r o	June 24	" 24-30	5	10	Vine vigorous, healthy.
101	Northern Light	Ont.	1890	m	l	m	r	" 28	" 17-24	8		Needs further trial.
102	Olita	Texas	1889					" 29				Needs further trial.
103	Onida	N. Y.	1890	m	sh	l	r	" 26	Sep. 17-24			Give further trial.
104	Osage	Kan.?	1890			l	r	" 27	" 10-17	7		Needs further trial.
105	Owosso	Mich.	1890	l	s	l	r	" 28	" 17-24	5	10	Like Catawba, but earlier.
106	Ozark	Kan.?	1890	m	s sh	m	r	" 28	" 10-17	3	6	Not a table grape.
107	Palmer	N. Y.	1890	m	m	l	r	" 26	Sep. 10-17	6	5	Probably an old variety.
108	Peabody	N. Y.	1890	m	m sh	m	o	" 26	" 3-10	5	10	Flavor not pleasant.

## GRAPES—CONTINUED.

Number.	Name.	Origin.	Planted.	Bunch.				Berry.				First bloom.	Ripe.	Quality, 1 to 10.	Product, 1 to 10.	Remarks.
				Size.	Form.	Size.	Form.	Size.	Form.							
l, large; m, medium; s, small.	l, long; m, medium; s, short; sh, shouldered.	l, large; m, medium; s, small.	r, round; o, oval.													
109	Perkins.	Mass.	1889	m	sh	m	o	June 24	Sep. 3-10	3	7	Foxy, very poor.				
110	Pocklington	N. Y.	1888	l	sh	l	r	" 26	" 24-30	6	8	Foxy, showy, late.				
111	Poughkeepsie	N. Y.	1888	s	m sh	s	s sh	" 27	" 17-24	10	1	Nearly a failure here.				
112	Prentiss	N. Y.	1888	m	m	m	r o	" 27	" 10-17	10	8	A good keeper.				
113	President (Lyon)	Texas	1889	s	s	s	r	" 24	" 17-24	6	1	Unworthy so far.				
114	Progress	Kan.?	1890	s	s	l	r	" 26		6		Not fully tested.				
115	Pulpless	Mich.	1892									C. Engle. Not fruited.				
116	Purity	Ohio	1889	m	l	l	r	June 27	Sep. 8-15	6	6	Identity doubtful.				
117	Rentz	Ohio	1889	l	sh	l	r	" 29	" 17-24	4		Needs further trial.				
118	Requa	Mass.	1890	l	m sh	m	r	" 27	" 10-17	7	7	Another Rogers' hybrid.				
119	Rochester	N. Y.	1890	l	m sh	m	r	" 22	" 10-17	6	10	Soon loses in flavor.				
120	Rockwood	N. Y.?	1891									Not yet fruited here.				
121	Rogers 5	Mass.	1889	m l	s	l	r	June 27	Sep. 17-24	7		Sweet and rich.				
122	Rogers 8	Mass.	1889	m	m	l	r	" 26	" 24-30	5	7	Rather late.				
123	Rogers 24	Mass.	1889	m	m	l	r	" 27	" 17-24	4	7	Bunch often small.				
124	Rogers 30	Mass.	1889	l	m	l	r	" 27	Oct. 1-8	6		Bunch often imperfect.				
125	Rommell	Texas	1889	m	m sh	m	r	" 26	Sep. 17-24	3	6	Too far north.				
126	Salam	Mass.	1888	l	s	l	r	" 24	" 17-24	6	7	Largest of Rogers' hybrids.				
127	Secretary	N. Y.	1890	l	l sh	m	r o	" 24	" 10-17	10	9	Vine unhealthy.				
128	Telegraph	Penn.	1890	m l	sh	m l	r	" 24	" 3-10	6	8	One of the early natives.				
129	Themis	Mich.	1891									Engle. Not yet fruited.				
130	Triumph	Ohio	1890	l	l sh	l	r	June 29	Oct. 15-22	8	10	Will not ripen here.				
131	Ulster	N. Y.	1888	m	sh	m	r	" 22	Sep. 8-15	9	10	Excellent. Red.				
132	Vergeunes	Vt.	1890	m	l	l	r	" 24	" 24-30	6	7	A market grape.				
133	Vesta	Mich.	1891									Engle. Not yet fruited.				
134	Victoria	N. Y.	1890	l	l sh	m	r	June 25	Sep. 24-30	3	10	Variety is spurious.				
135	Warder	Ill.	1892									From Div. Pom. Not fruited.				
136	Wells	Mo.	1890	s	s	m	r	June 24	Sep. 8-15	2		Needs further trial.				
137	White Ann Arbor	Mich.	1888									Has failed to fruit here.				
138	White Beauty	Kan.	1890			s	r	June 25	Sep. 17-24	6		Needs further trial.				
139	White Imperial	Kan.	1890	s	s	s	r	" 22	" 3-10	8		Promising, white.				
140	Wilder	Mass.	1888	l	sh	l	r	" 24	" 17-24	8	8	One of Rogers' best.				
141	Willis	Ill.	1890	m	sh	m	r	" 26	" 10-17			Plant probably spurious.				
142	Winchell	Vt.	1889	l	sh	m	r	" 26	Aug. 27-30	10	10	Best of its season, early.				
143	Witt	Ohio	1889					" 29	Sep 17-24	7	7	White Concord seedling.				
144	Woodruff	Mich.	1888	l	s sh	l	r	" 24	" 24-30	4	7	Varies in quality.				
145	Worden	N. Y.	1888	l	s	l	r	" 24	" 17-24	6	8	An improved Concord.				
146	Wyoming	N. Y.	1888	s	sh	s m	r	" 24	" 10-17	3	6	Of little value.				

Agawam is one of the numerous Rogers' hybrids, of fair quality. It keeps till March, with ordinary care, in a cool cellar.

Aminia is, by some good judges, considered the best of the Rogers hybrids.

Beagle, Bell, Blanco, Brilliant, Campbell, Olita, President (Lyon), and Rommell, all seedlings of T. V. Munson of Texas, are now just in bearing, with little apparent promise, so far, of value in this, to them, far northern region. The fruit mildews badly, although thoroughly sprayed.

Brighton is very vigorous and productive, planted as it is here among other varieties, which may be supposed to insure the more perfect fertilization of its bloom. In quality it has few if any superiors, though it

soon begins to deteriorate, not retaining its fine flavor beyond early December.

Caywood (No. 50) was received in 1888 or 1889 for trial, from its originator, the late A. J. Caywood of Marlboro, New York. It has now fruited two or three years, giving promise of value for the market.

Chidester, Nos. 1, 2, 3, and 4, are *Labrusca* seedlings, by C. P. Chidester of this state, which give decided promise of value. Nos. 1 and 2 were exhibited for premium at the state fair in 1887, and the first premium was awarded to No. 1 by the State Horticultural society, which named it President Lyon, the same name having been subsequently bestowed by T. V. Munson of Texas upon one of his seedlings (see tabular No. 113). The quality of No. 1 is excellent but, so far, it is a very thin bearer.

Cortland has, this season, produced a bountiful first crop here. It is very early, even earlier than Moore; large, black; it has a possible value as a market grape for that reason.

Delaware, here, proves quite as productive and profitable as Concord, since its beauty and superior quality, notwithstanding its diminutive size, insure higher prices in the market.

Diamond is early; both bunch and berry large; the plant is vigorous and productive. Its good quality and showy appearance render it a special favorite with the birds.

Goethe (a Rogers hybrid), Highland (a Ricketts hybrid) and Triumph, a hybrid by Campbell of Ohio, are all too late for the latitude of Michigan, save under exceptionally favorable conditions.

Guinevra, Honey, Iris, Michigan, Pulpless, Thermis, and Vesta are seedlings originated by C. Engle of Michigan. So far as tested, several of them are of good quality. Several, if not all of them, are vigorous. A longer trial is needful.

Hayes, of medium season; Lady, early; Pocklington, rather late, and Lady Washington, still later, are amateur white grapes, with the exception of Pocklington, scarcely adapted to the market.

Iona stands out prominently as the finest of the high flavored class of American grapes. The late Edward Bradfield of Ada, Michigan, was eminently successful in growing and fruiting it, and the same, for a time, was true of Judge Ramsdell, even so far north as Traverse City, and yet, with most growers, it has proved a sad failure.

Isabella, one of the oldest of our native varieties, where it can be fully ripened, still stands high, even as a dessert grape. It is also a good keeper.

Janesville is valuable, if at all, for its earliness and abundant hardiness, which render it useful in trying locations in which better varieties would be likely to fail.

Jefferson, a cross of Concord and Iona, by Ricketts, is among the most desirable of long keepers. Its flavor is mild and pleasant and the pulp is very tender. It can be kept till March without special care.

Jessica is a very early white grape; small, white, and very sweet; seeds large for the size of the berry.

Jewell, originated by the late John Burr of Kansas, is rather small in both bunch and berry, but, on account of its earliness and generally good qualities, it is one of the most desirable of black amateur grapes.

Of four varieties received for trial from Josselyn of New York, two have now fruited here, for the first time, one a black grape and the other

white. Both are promising, although they require more extended trial. They are yet nameless.

Lutie has been several years before the public and, so far, meets nearly universal condemnation. Although sweet, it is intolerably foxy. Undesirable for any purpose.

Niagara has apparently already acquired an assured position as the leading white market grape. Though not superior, if even equal, to Concord in quality, here at least it is even more productive.

Owosso, a Michigan seedling, is somewhat like its reputed parent, the Catawba, though shorter in bunch and earlier in season.

Palmer is a large black grape, found growing in a garden here by the person whose name it temporarily bears. Since including it in the foregoing table, we learn that it is a seedling originated in New York by Mrs. Millington, who subsequently removed to this place, bringing the variety with her. Such being the fact, it should doubtless bear her name, rather than that here given. From its trial thus far it seems likely to prove desirable as a market variety.

Poughkeepsie is very much like Delaware in fruit but, so far as grown here, the plant is the least vigorous and productive one upon the premises. It may be fairly considered worthless, certainly so here.

The variety received and fruited here as Purity, in color and general appearance of fruit might appropriately bear that name, but it is clearly not the genuine variety, as named and described by Geo. W. Campbell, the originator.

Rochester, originated by Ellwanger & Barry of Rochester, New York, is of fair quality, bunch large, and the plant a good grower and an abundant bearer.

Secretary, one of the best of the Ricketts hybrids, so far as the fruit is concerned, but the plant is far from satisfactory, being of feeble habit and specially liable to mildew.

Ulster is high in quality and the plant very productive, though slightly lacking in vigor.

Winchell. This variety has been several years before the public under this name, which is that of the originator or discoverer. Originating, as it did, in Vermont, it has more recently been disseminated from a New England nursery as Green Mountain. Under pomological rules, the earlier name, being an appropriate one, is clearly entitled to precedence. The plant is vigorous and productive, and the fruit very early and of excellent quality.

Martha, as received and tested here, proves spurious, being a black grape.

Massasoit, Merrimac, Salem, and Wilder are valuable, well-known Rogers hybrids; too generally known to require description or characterization.

Moore (Early) occupies a somewhat doubtful position as an early market grape of the Concord type. It has several competitors of higher quality.

Moyer is very early, sweet, and pleasant. Bunch and berry rather small. An amateur grape only.

Nectar has small, imperfect foliage and has, so far, proved very unproductive.

Woodruff, named for its originator, a resident of Ann Arbor, Michigan, is a large, bright red, Concord seedling sometimes of very good quality but

variable. The plant is very vigorous, and occasionally over-productive to such extent as to seriously affect the quality of the fruit.

Worden is a typical Concord seedling, with a larger bunch and berry, of somewhat improved quality, as well as earlier. It is, to some extent, popular as a market variety.

Wyoming, occasionally known as Wilmington Red is, at the best, but a slight remove from the wild type and, with the many more recent and greatly improved varieties, it can scarcely be considered worthy of cultivation.

#### PLUMS (*Prunus*).

Insects have been less persistent, than in previous years, in their attacks upon the foliage and fruit of the plum.

A little Paris green was applied in connection with the spray, but jarring has been the chief reliance for defense against the "Little Turk."

Upon a few trees, growing in light soil, the rose chafer (*Macrodactylus subspinosus*), has been troublesome, as has been the case for several years; since poisonous sprays prove ineffectual, hand-picking was resorted to for their suppression.

The slug (*Eriocampa cerasi*), has been less troublesome this season than last and has yielded readily to a spray of tobacco water.

In common with the entire plantation, the plums received a spray of Bordeaux late last autumn.

On April 10 and 11, last, they were given a spray composed of 4 lbs. copper sulphate, 3 lbs. stone lime, and  $2\frac{1}{2}$  oz. Paris green in 32 gals. water.

On June 8 they were again sprayed with the same preparation.

On June 28 a spray of kerosene emulsion was applied to subdue the slug, using  $\frac{3}{4}$  lb. soap, 2 gals. kerosene, in 10 gals. water.

July 14 and 15 a spray was applied, using 2 lbs. copper sulphate,  $1\frac{1}{2}$  lbs. lime, and  $2\frac{1}{2}$  oz. Paris green in 32 gals. water. Several varieties of plum lost more or less of their older foliage, apparently as the result of this last application. (Due probably to the use of air-slaked lime.)

Aug. 7 and 8 they received a final spray of tobacco water, to subdue the slug which had again appeared in considerable numbers.

The following table includes only such varieties of plum as have bloomed and fruited (one or both) this year.

The species to which several of these varieties should be assigned is yet an open question among botanists, for which reason, in such cases, a mark of doubtfulness is appended.

This being the first crop of nearly all the varieties of plum here tabulated and the crop, in most cases, comprising but few specimens, it seems inexpedient to venture upon descriptions or estimates of values. These are, therefore, deferred to await subsequent developments.

## PLUMS.

No.	Name.	Species.	Planted.	Bloomed.	Ripened.
1	Bailey	Domestica	1889	May 22.	Aug. 30.
2	Black Prune	Domestica	1888	" 22.	Sept. 1.
3	Botan	Hattan	1890	" 19.	
4	Bradshaw	Domestica	1890	" 22.	
5	Burbank, 2	Domestica?	1890	" 18.	
6	Burbank, 11	Domestica?	1890	" 19.	
7	Cheney	Americana	1888	" 20.	" 1.
8	Cook (Choice)	Americana?	1890	" 24.	
9	De Soto	Americana	1888	" 22.	" 15.
10	Englebert	Domestica	1890	" 24.	
11	Forest Garden	Americana	1889	" 22.	
12	Forest Rose	Hortulana var. Mineri	1890	" 24.	
13	Golden (Beauty)	Hortulana	1890	" 27.	Oct. 7.
14	Hawkeye	Americana	1888	" 22.	
15	Jewell		1890	" 27.	
16	Kingston	Domestica	1890	" 19.	
17	Long Fruited	Hattan	1890	" 22.	
18	Maquoketa	Americana	1888	" 24.	" 7.
19	Marianua	Cerasifera Hyb.?	1890	" 27.	
20	Merunka	Domestica	1888	" 22.	Aug. 16.
21	Masu	Hattan	1890	" 19.	
22	Miner	Hortulana var. Mineri	1890	" 24.	
23	Moore (Arctic)	Domestica	1890	" 18.	
24	Moreman	Hortulana	1890	" 30.	
25	Ogon	Hattan	1890	" 20.	" 11.
26	Pottawatomie	Angustifolia	1888	June 1.	" 14.
27	Prairie (Flower)	Hortulana var. Mineri?	1890	May 24.	Oct. 10.
28	Red Nagate	Hattan	1890	" 27.	
29	Robinson	Angustifolia	1890	" 30.	Sept. 8.
30	Rollingstone	Americana	1888	" 22.	" 7.
31	Satsuma	Hattan	1890	" 22.	Oct. 5.
32	Shiro Sinomo	Hattan	1890	" 19.	Aug. 12.
33	Simon	Simoni?	1888	" 15.	" 12.
34	Twenty Orel	Domestica	1888	" 22.	
35	Van Buren	Americana var.	1890	" 22.	
36	Weaver	Americana	1890	" 22.	
37	White Nicholas		1890	" 22.	
38	Wolf	Americana	1888	" 24.	Sept. 14.
39	Yosebe	Hattan	1890	" 15.	July 26.
40	Moldovka	Domestica	1888	" 22.	Aug. 22.

Bailey is the name temporarily attached to a variety of the common garden plum of the east, which was received, in scion, from S. S. Bailey of Kent county, Michigan. It proves to be very vigorous, of upright habit, and the fruit is of more than medium quality and size. It has produced a few fruits this season for the first time here.

Black Prune, Merunka, Moldovka, and Twenty Orel are varieties imported by Prof. Budd of Iowa, from northeastern Europe. They are of the *domestica* species and, should they prove productive, may be found desirable here.

Botan (foisted upon the public as *Abundance*, for the apparent purpose of promoting sales), Long Fruited, Masu, Ogon, Red Nagate, Satsuma, Shiro Sinomo and Yosebe are varieties coming from Japan. Satsuma is of a type distinct from all others. It is large, round, and very dark purple in both skin and flesh. Yosebe is notable for its extreme earliness, it being more than a week in advance of any other variety, though not of high quality.

Bradshaw, Englebert, and Moore (Arctic) are extensively known as market varieties, wherever the *domesticas* are successful.

Burbank Nos. 2 and 11 are understood to have originated with that noted experimenter, Luther Burbank of California. They have blossomed here the past season but have not fruited.

Cheney, Cook, DeSoto, Forest Garden, Forest Rose, Golden (Beauty), Hawkeye, Jewell, Maquoketa, Miner, Moreman, Pottawatomie, Prairie (Flower), Rollingstone, Van Buren, Weaver, and Wolf are all more or less generally known and valued, at the north and west, where the finer eastern varieties fail.

Kingston and (White) Nicholas have had but a short and imperfect trial here and have not yet shown their qualities sufficiently for characterization.

Marianna is far better known for its ability to root readily from cuttings and afford a supply of stocks for the nursery than for its value as a producer of fruit.

Robinson proves to be a vigorous grower and has, the past season, produced a fine crop of good-size, pleasant-flavored fruit quite superior to most if not all the native western varieties that have so far fruited here.

Simon (*Prunus Simoni* of nursery catalogues), has now fruited here profusely; the large, bright colored, very peculiar fruit, as grown here, is far from agreeable in flavor. Botanists seem to consider it a sort of Ishmaelite among plums, having specific characteristics peculiar to itself.

#### PEARS. (*Pyrus communis*.)

The unprecedented drouth of the past season had, apparently, little injurious effect upon the pear, perhaps on account of the deep rooting habit of the species.

The spray of Bordeaux, given late in the autumn of 1892, was followed on June 12, 1893, with a spray composed of 4 lbs. copper sulphate, 3 lbs. lime, and  $2\frac{1}{2}$  oz. Paris green in 32 gallons of water.

On June 28 the pears received a spray of kerosene emulsion, applied to subdue the slug (*Eriocampa cerasi*).

On July 10 to 13 a final spray was applied, consisting of 2 lbs. copper sulphate,  $1\frac{1}{2}$  lbs. lime, and  $2\frac{1}{2}$  oz. Paris green in 32 gallons of water. This application, which injured the foliage of peaches, plums, and cherries, occasioned no perceptible injury to that of pears.

The blight which, late in 1892, ruined a few pear trees, has again appeared this season, upon a tree of Seedless (Bessemianka), which, when discovered, were promptly cut back to apparently healthy wood. Indications, however, point to its probable reappearance next season. This appearance of blight in two successive seasons, in both cases upon Russian varieties, may be supposed to indicate a special liability to such attacks. Since both were standing upon rather moist soil, this might be supposed to have induced the attack, but for the circumstance that they were alternated with Bosc, Anjou, and Mount Vernon, which remain in obviously healthy condition.

The foliage of the pears has been exempt from leaf spot (*Fusicladium dendriticum*) (which attacks both foliage and fruit of the apple and pear), except that three or four trees of Jones and Mount Vernon pears (which perchance may have been omitted in the spraying), have been seriously attacked.

The following varieties have bloomed this season, and a few fruits have been brought to maturity:

No.	Variety.	Bloom.	Ripened.	Remarks.
1	Ansant	May 22	Nov. Dec.	European. Promises well.
2	Bloodgood	" 22	Aug. 23	An excellent amateur pear.
3	Clapp Favorite	" 29	Sept.	Large, good; soon rots at the core.
4	Dana Hovey	" 24	Winter	A small fruit, of high quality.
5	Gakovska	" 24		An importation from Russia.
6	Howell	" 22	Oct.	A good market and home fruit.
7	Lawrence	" 22	Winter	A desirable winter variety.
8	Lucrative	" 27	Sept.	A superior pear for home use.
9	Mount Vernon	" 22	Nov. Dec.	A very good amateur pear.
10	Rostiezer	" 27	Aug.	Not beautiful, but excellent.
11	Seckel	" 27	Oct.	The standard of high quality.
12	Victorina	" 24		Russian, not yet fruited.
13	Winter Nelis	" 27	Dec.	The prince of winter pears.

#### APPLES (*Pyrus malus*).

The severe attack of scab, *Fusicladium dendriticum*, of last year so enfeebled the apple trees that, in most cases, few fruit buds were developed and, doubtless for this reason, at least in part if not wholly, there was a decided paucity of bloom last spring. There were, however, a few notable exceptions, prominent among which were the Keswick and Oldenburg, both of which were, in a great measure, exempt from scab last year, and have produced fine crops of perfect fruit this season.

The green aphid (*Aphis mali*) has proved somewhat persistent this season, yielding reluctantly to sprays of kerosene emulsion and tobacco water, both of which were applied in turn. No other insects have, to a serious extent, infested the apple during the season, except that a very few fruits were found to be inhabited by the larvæ of the codlin moth, which were promptly gathered up and effectually disposed of.

A very considerable number of varieties of apple (as well as of other fruits) were received, in scion, from the National Division of Pomology, on the 28th of March last, coming originally, as is understood, from eastern or northeastern Austria. These were topgrafted upon trees in orchard, heretofore planted for such purpose, and also scions of each variety were inserted in nursery stocks, as a precaution against the loss of a variety. These are expected to be in condition to be planted out the coming spring.

Aside from the general spraying in November, 1892, which included the apple, additional sprayings have been applied as follows:

On June 12, a spray composed of 4 lbs. copper sulphate, 3 lbs. lime, and 2½ oz. Paris Green, in 32 gallons of water.

On June 22, a spray of kerosene emulsion, to subdue the aphid.

On August 5 to 8, a spray of strong tobacco water, for the same purpose.

Whether as the result of the sprayings specified, or otherwise, the foliage of the present season has nearly or quite resumed a healthy condition, and the trees generally have nearly or quite recovered their pristine condition.

The following varieties have bloomed and matured fruit the past season:

No.	Name.	Bloomed.	Ripened.	Remarks.
1	Borovinka .....	May 24..	Sept. ....	This proves to be identical with Oldenburg (as pr. Downing, page 102). This resists the scab, having fruited last year and produced a heavy crop this year.
2	Keswick (Codlin) .....	" 23..	Oct. ....	
3	Titovka .....	" 29..	Sept. ....	
4	Winter Streifling .....	" 25..	Oct. ....	

It will be observed that Nos. 1, 3 and 4, are Russian or East European varieties, while No. 2 is English. This last has no superior if indeed it has an equal in this climate as a hardy tree, bearing early and profusely. It is strictly a culinary fruit, for which purpose it scarcely has an equal.

#### QUINCES (*Cydonia*).

The quince during the two years last passed has been notably free from insect depredations. The vigorous condition of the plants may perchance have contributed to this apparent exemption, since many insects seem to avoid healthy, vigorous trees, devoting themselves rather to such as may be enfeebled or diseased.

The slug (*Eriocampa cerasi*) made its appearance at the usual season.

There has been no indication of fungus upon either plant or fruit, which was undoubtedly due to the use of fungicides, as in former years there has been much injury from leaf-blight.

The plants were treated with a spray of kerosene emulsion on June 20, to subdue the slug, and a spray of tobacco water was applied on August 5, to 8 for the same purpose and with similar result.

Varieties of quince have bloomed and fruited this season as follows:

No.	Name.	Bloomed.	Ripened.
1	Alaska .....	May 7 .....	No fruit.
2	Champion .....	June 5 .....	Last of October.
3	Fuller .....	May 18 .....	No fruit.
4	Meech .....	June 5 .....	Last of October.
5	Missouri (Mammoth) .....	" 5 .....	No fruit.
6	Orange .....	" 5 .....	October.
7	Rea .....	" 5 .....	October.

Champion is vigorous and very prolific but rather late.

Meech is in season about with Champion.

Orange is yet at the head, so far as season and general desirability are concerned.

Rea is much like Orange so far as appearance and size are concerned.

#### NUTS.

Seedlings from the large native Hathaway chestnut (*Castanea vesca*), planted in 1888, have this season shown a few catkins, but failed to set fruit.

Paragon, which has for three or four seasons produced only abortive nuts, has this season ripened a very large crop (for so young a tree), the branches being so heavily loaded with the large burs that more than half were removed early in the season to insure the development of the remainder. The nuts were frequently three in a bur, of the usual size of the imported ones, and superior in quality, ripening about with our natives.

Among the varieties received and planted as Japanese chestnuts, one received as "Japanese Imported, grafted," planted in 1890 and now less than seven feet in height, has this season ripened a fine crop of large nuts. The burs are even smaller than those of our natives, usually containing but a single large round nut. They ripen at the usual season.

The European or Spanish chestnut, planted in 1890, has also shown a little fruit the past season.

CHINQUAPIN (*Castanea pumila*—or Dwarf chestnut).

Owing to the inability of this to bear transplanting, the nuts have been two or three times obtained and planted, but so far without success. Another lot has been obtained and planted this fall, the nuts coming from Tennessee.

PECAN (*Hickoria olivæformis*).

Nuts of pecan were received from southern Iowa and planted here in the fall of 1888. They prove hardy, so far, and this season have made good growths. The Stuart pecans, received from the Division of Pomology, have grown and have been protected for the winter, since, coming as they do from Texas, their hardiness in the climate of Michigan must be regarded as very doubtful.

ENGLISH WALNUT, OR MADEIRA NUT (*Juglans regia*).

This was planted in 1889 and, so far, has not winter-killed and has made moderate, healthy growths.

Dwarfs of this species, under the name *Præparturiens*, were also planted in 1890 and have, so far, suffered no apparent injury from our winters.

JAPAN WALNUT—(*Juglans Seiboldi*.)

This was planted in 1890, and has proved perfectly hardy here. It is a very vigorous grower, and has matured fruit here this season. In both tree and fruit it is much like our indigenous butternut, though more vigorous. So far the fruit is scarcely equal to the butternut.

ALMONDS—(*Amygdalus communis*.)

The Luelling almond, received from a Missouri nursery and planted in 1892, has proved hardy here, but has not yet fruited.

The "Soft Shelled Almond," planted here last year, proves hardy so far.

FILBERTS AND HAZEL-NUTS—(*Corylus*.)

The Kentish cob filbert planted in the spring of 1892 has withstood the past winter unharmed, and has made satisfactory growth this season. It promises to fruit next season.

The unnamed hazel-nuts from the Division of Pomology planted last spring may be expected to more fully develop their peculiarities during next season.

FIGS—(*Ficus carica*.)

The cuttings of Brunswick fig, from H. E. Van Deman, rooted here last season, were planted permanently last spring. They are showing partially developed fruit this fall, and have now been laid down and covered with earth and litter to protect them from the alternate freezing and thawing of winter.

SOUTH HAVEN, MICHIGAN. {  
November 24, 1893. }

T. T. LYON.

## MICHIGAN FRUIT LIST.

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L. R. TAFT.

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Bulletin No. 105.—Horticultural Department.

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With the long list of varieties found in the fruit catalogues of our State and National horticultural societies, and the even more confusing ones in the nurserymen's list, it becomes a difficult matter to make a desirable selection, unless a person has a definite knowledge of the varieties that succeed best in the locality where he lives.

While a few varieties seem to thrive in nearly all sections, others, that may be very valuable in some localities, are nearly worthless elsewhere, owing to the unsuitable conditions of climate or soil. It will be impossible, then, for any one list to suit the wants of all persons. In order to learn the opinion of the growers in the different sections of the state as to the best varieties for their respective localities, a circular was last summer sent to some two hundred fruitgrowers asking their aid in the preparation of a fruit list for Michigan. The circular contained the last fruit list for this state issued by the American Pomological society, and the varieties there given were marked by the correspondents with various symbols to indicate their value for the different localities. In several instances the lists were considered by the local horticultural societies, and votes were taken to determine the mark that should be given them.

The symbols used to indicate the value of the different varieties were as follows: two stars (\*\*) when they were generally successful in the particular locality and were worthy of being placed in every list; one star (\*) for varieties that were less generally successful and that were of less value than those given two stars; a dagger (†) indicated new and promising varieties and a dash (—) that the varieties were of no value and should be stricken from the list. A great difference of opinion was noticed in the returns, as, in a few cases, varieties were given two stars by some persons while others in the same county marked them with a dash. As a rule, however, a remarkable unanimity of opinion was shown, not only

in the different counties, but in the dozen or more counties that go to make up one of the sections. So far as concerns the varieties marked with two stars, there seems to be but little difference in the rating given them, except that they are occasionally dropped out in the northern counties on account of their lateness or lack of hardiness.

The varieties marked with two stars in the following list were rated in that way by a majority of the correspondents in the different sections into which the state is divided, and, as will be seen, they appear to be adapted to nearly all sections. Those marked with a single star received a minority of the votes for the two-star list, or were regarded as worthy of one star by a considerable number of persons. The fact that a fruit is thus marked indicates that it has considerable value, but that as a rule the varieties with two stars are of more value and that, unless a long list is desired, it should not be selected. There are, for various reasons, exceptions to this rule, and so far as possible they will be explained in the notes that follow each class of fruits.

When a variety is marked with a star followed by an interrogation mark (\*?), it indicates that its use is favored by a few persons, but it is regarded as less desirable for general planting than those given one star. For certain purposes and in some localities it may be worthy of trial.

We have dropped from the list all varieties that were given a dash by a majority of those reporting upon them, or where there have not been as many as five persons from the entire state who thought them worthy of either one star, or a dagger.

The dagger has been here given to such new kinds as have been sufficiently tested in the state to warrant the statement that they are at least promising and worthy of trial upon a small scale. In the notes, mention is also made of some of the new varieties that have done well in other states but which have not yet been sufficiently tested in Michigan to determine their value, although most of them are under trial.

In dividing the state into sections we have placed in the Southern Lake Shore division all of the counties bordering Lake Michigan south of Muskegon, and in the Northern Lake Shore section all north of and including Muskegon. The two southern tiers of counties are considered to be in Southern Michigan; the three tiers north of this make up Central Michigan, and the counties north of Gratiot are considered as in Northern Michigan.

## APPLES.

The list of apples will enable any intelligent person to select a collection that will be reasonably certain to succeed in his locality, and by noting the column marked "Use" the particular purpose for which they are valued can be learned.

Particular thought should be given to this, as upon it the selection should depend. In making out a list for home use, we should not only select kinds that are healthy, vigorous trees and abundant bearers, but it should include both sweet and tart sorts, and afford a supply throughout the season of both dessert and cooking varieties. To secure this, one will need have from fifteen to twenty varieties in the orchard designed for family use. Of the summer and fall sorts one, or at most two, trees of a kind will answer unless fruit is desired to sell or give away, but of the win-

ter sorts a larger number is desirable, in order to be sure of a supply in years of partial failure; if there is a surplus at any time a ready sale can always be found for well-grown fruit of desirable sorts.

## APPLES.

ABBREVIATIONS.—SIZE—l, large; m, medium; s, small. FORM—r c, roundish conical; r ob, roundish oblate; r, roundish. COLOR—y r, yellow and red; r s, red striped; g y, greenish yellow; rus, russeted; y rus, yellow and russet. QUALITY—g, good; v g, very good; b, best. USE—F, family use; K M, kitchen and market; F M, family and market. SEASON—S, summer; E A, early autumn; L A, late autumn; W, winter. ORIGIN—Usual abbreviations for names of countries.

Names.	Description.							Value.				
	Size.	Form.	Color.	Quality.	Use.	Season.	Origin.	Southern Lake Shore.	Northern Lake Shore.	Southern Michigan.	Central Michigan.	Northern Michigan.
Alexander.....	l	rc	rs	g	K M	E A	Rus.	*	*	*	*	*
Autumn Bough.....	m	rc	rs	vg	F	E A	Am.	**	**	*	**	*
Bailey Sweet.....	l	rc	rs	vg	F M	L A	Am.	*	*	*	**	*
Baldwin.....	l	rc	rg	vg	F M	W	Am.	**	*	**	**	**
Belmont.....	l	rc	yr	b	F M	W	Am.	*	*	*	*	*
Ben Davis.....	l	rc	yr	g	K M	W	Am.	**	*	*	**	*
Benoni.....	m	rob	yr	vg	F M	S	Am.	*	*	*	**	*
Blenheim Pippin.....	l	rob	yr	vg	F M	W	Eng.	**	*	**	**	*
Blue Pearmain.....	l	rc	r	g	M	W	S	*	*	*	*	*
Bough.....	l	ob	gy	vg	F M	S	Am.	**	*	**	**	*
Bullock, (Am. Golden Russet).....	s	rc	y rus	b	F M	W	Am.	**	*	*	*	*
Canada Reinette.....	l	rc	gy	vg	F M	W	F.	**	*	*	*	*
Chenango (Strawberry).....	m	ob c	gr	vg	F M	E A	Am.	*	*	**	**	*
Clayton.....	l	c	yr	g	F M	W	Am.	*	*	†	†	*
Colvert.....	l	rob	yr	g	F M	L A	Am.	*	**	**	*	*
Dyer (Pomme Royal).....	m	r	gy	vg	F	E A	F.	**	*	**	**	*
Early Harvest.....	m	rob	gy	vg	F M	S	Am.	*	**	*	*	*
Early Joe.....	s	fl	yr	b	F	S	Am.	*	**	*	*	*
Early Strawberry.....	s	r	rs	vg	F	S	Am.	*	*	*	*	*
Esopus.....	l	ob	yr	b	F M	W	Am.	*	*	*	*	*
Fallawater (Tulpehocken).....	l	rc	gy	g	M	W	Am.	*	*	*	*	*
Fall Jenneting.....	l	fl	gy	g	M	E A	Am.	*	*	**	**	*
Fall Orange.....	l	r	yr	g	K M	L A	Am.	*	*	*	*	*
Fall Pippin.....	l	rob	gy	vg	F M	L A	Am.	*	*	**	*	*
Fameuse (Snow Apple).....	m	rob	rs	vg	F M	W	F.	*	*	*	*	*
Garden Royal.....	m	rob	yr	b	F	S	Am.	**	*	*	**	*
Gideon.....	l	r	gy	vg	F M	W	Am.	†	†	†	†	†
Golden Russet (N. Y.).....	m	rob	y rus	vg	F M	W	Am.	*	*	*	**	*
Golden Sweet.....	l	r	gy	vg	F M	S	Am.	*	*	**	*	*
Golding.....	l	rob	gy	vg	F M	W	Am.	**	**	**	**	*
Gravenstein.....	l	rob	yr	vg	F M	L A	Ger.	*	*	*	*	*
Grimes.....	m	rob	gy	vg	F	W	Am.	**	*	**	**	*
Hubbardston (Nonesuch).....	l	rc	yr	vg	F M	W	Am.	**	*	**	**	*
Jefferis.....	m	rob	yr	vg	F M	E A	Am.	*	*	*	*	*
Jersey Sweet.....	m	r	yr	vg	F M	E A	Am.	*	*	*	*	*
Jewett Red.....	m	rob	r	g	F M	W	Am.	**	**	*	**	*
Jonathan.....	m	rc	yr	vg	F M	W	Am.	**	*	**	**	*
Keswick.....	m	rc	gy	g	K M	E A	Eng.	*	*	*	*	*
Lady.....	s	fl	yr	vg	F M	W	F.	*	*	**	**	*
Lady Sweet.....	l	r	yr	vg	F M	W	Am.	*	*	*	**	*
Late Strawberry (Autumn).....	m	r	yr	vg	F M	L A	Am.	*	*	*	*	*
Lowell (Tallow Pippin).....	l	rc	gy	vg	F M	E A	Am.	*	*	*	*	*
Maiden Blush.....	m	r	gy	g	F M	E A	Am.	**	**	**	**	*
Mann.....	m	rob	yr	vg	F M	W	Am.	*	**	*	*	*
Melon.....	m	rob	ys	b	F M	W	Am.	*	*	*	*	*

## APPLES.—CONTINUED.

Names.	Description.							Value.				
	Size.	Form.	Color.	Quality.	Use.	Season.	Origin.	Southern Lake Shore.	Northern Lake Shore.	Southern Michigan.	Central Michigan.	Northern Michigan.
Monmouth.....	l	fl	yr	vg	F M	W	Am.	*	*	*	*	---
Mother.....	m	rc	yr	b	F M	W	Am.	*	*?	*	*	---
Munson ( <i>Orange Sweet</i> ).....	m	fl	yg	g	K M	L A	Am.	*	*?	*	*	---
Newton (Spitzenburg).....	m	rob	yr	b	F M	W	Am.	*	*	*	*	*?
Northern Spy.....	l	rc	yr	b	F M	W	Am.	**	**	**	**	**
Oakland (Co. Seek-no-further)	m	rob	yr	vg	F	W	Am.	*	*	*?	*	---
Oldenburg (Duchess of).....	m	rob	yr	g	M	S	Rus.	**	**	*	**	---
Ortle ( <i>White Bellflower</i> ).....	m	ob	gy	vg	F M	W	Am.	*	*	*	*?	---
Peck.....	m	r	gy	vg	F M	W	Am.	*	*	*	*	*
Perry Russet.....	m	rc	rus	g	F M	W	Am.	*?	*	*?	*	---
Pewaukee.....	l	fl	rs	g	F M	W	Am.	*	*?	*	*?	*?
Porter.....	l	ob	gy	b	F M	A	Am.	---	*	*	*	---
Primate.....	m	rc	gy	b	F	E A	Am.	**	*	*	*	---
Pumpkin Sweet ( <i>Pound Sweet</i> )	l	robl	y	g	K M	E W	Am.	*?	*	*?	*?	---
Rambo.....	m	fl	yr	vg	F M	L A	Am.	*	*	*?	*	*?
Rall.....	l	rc	yr	vg	F M	W	---	*	*	*?	*	*?
Red Astrachan.....	l	r	yr	g	K M	S	F.	**	**	*	**	**
Red Canada ( <i>Steele's Red</i> ).....	m	rob	yr	b	F M	W	---	**	**	*	**	*
Rhode Island Greening.....	l	rob	gy	vg	F M	W	Am.	**	*	*	*	*
Ribston.....	m	r	yr	vg	F M	W	Eng.	*	*	*	*	*
Rome Beauty.....	l	r	yr	g	M	L A	Am.	*?	---	*?	*?	---
Roxbury Russet.....	m	rob	yrus	vg	F M	W	Am.	*	*	*	*	*
Saint Lawrence.....	l	fl	yr	vg	M	A	Am.	*	*	*	*	*
Shiawassee.....	m	fl	ry	vg	F M	A	Am.	**	**	**	**	**
Smith ( <i>Cider</i> ).....	l	rob	yr	g	F M	W	Am.	*	---	*?	*?	*?
Stark.....	l	rc	yr	g	F	W	Am.	**	*?	*	*?	*
Summer Pearmain ( <i>American</i> )	m	ob	yr	b	F	S	Am.	*	*	*	*	*
Summer Pippin.....	m	obc	yr	g	K M	L S	Am.	*	---	---	---	---
Summer Queen.....	l	rc	yr	g	K M	S	Am.	*	*?	*	*	*
Swaar.....	l	rob	gy	b	F M	W	Am.	*	*	---	*	*
Tetofsky.....	m	flc	yr	g	K	S	Rus.	*	*	*?	*	*
Talman.....	m	r	gy	vg	K M	W	Am.	**	**	*	**	**
Tompkins King.....	l	r	yr	vg	F M	W	Am.	**	**	*	**	**
Twenty Ounce ( <i>Cayuga Red</i> ).....	l	r	rs	vg	F M	L A	Am.	**	**	*	**	*
Wagener.....	m	rob	yr	b	F	W	Am.	**	**	*	**	*
Walbridge.....	l	rob	rs	vg	F	W	Am.	†	†	†	*?	*?
Wealthy.....	m	rob	r	vg	F M	W	Am.	*	**	---	*	**
Westfield ( <i>Seek-no-further</i> ).....	l	rc	yr	b	F M	W	Am.	*	*	---	**	*
Williams.....	m	rc	yr	g	M	S	Am.	*	---	*	*?	---
Winesap.....	m	r	yr	vg	F M	W	F.	---	---	*	*	---
Wolf River.....	l	rob	r	g	F M	W	Am.	*	---	---	*?	---
White Bellflower.....	l	ob	gy	vg	F M	W	Am.	*	*	*	*	---
Yellow Newtown.....	l	rob	gy	vg	F M	W	Am.	*	*	*?	*	---
Yellow Transparent.....	m	rob	y	g	K M	E S	Rus.	*	*	*	*	---

For nearly all sections of the state the following twenty varieties will make a good family collection:

Red Astrachan, Bough (Sweet), Oldenburgh, Primate, Chenango, Keswick, Maiden Blush, Shiawassee, Twenty-Ounce, Bailey (Sweet), Westfield, Jonathan, Hubbardston, Grimes, Baldwin, Talman, King, R. I. Greening, Red Canada, N. Spy, and Golden Russet (N. Y.).

As a second choice some of the following could well be used: Early Harvest, Yellow Transparent, Tetofsky, Williams, Early Strawberry, Early Joe, Alexander, Lowell, Gravenstein, Fameuse, Colvert, Porter, Fall Pippin, St. Lawrence, Jefferis, Bullock, Canada Reinette, Wealthy, Esopus, Late Strawberry, Oakland, Mother, Peck, Rambo, Rall, Swaar, Winesap,

Yellow Bellflower, and Roxbury Russet. Wagener succeeds well in the northern counties, and there would be in the two star list.

Of the varieties given in the second list, President Lyon recommends the following for a place in the first list for a family collection: Early Harvest (or Yellow Transparent), Early Strawberry, Jefferis, St. Lawrence, and Roxbury Russet. He would also retain in the fruit list such apples as Cogswell, Manomet, McClellan, and Mexico, which are certainly valuable sorts for dessert or cooking purposes.

In the third class, marked \* ?, are such kinds as Autumn Bough, Blenheim, Dyer, Fall Jenning, Fall Orange, Garden Royal, Golding, Jersey Sweet, Perry Russet, Pewaukee, Rome Beauty, Stark, Summer Queen, Summer Pippin, and Wolf River.

Of these the Pewaukee, Stark, and Wolf River, have not been very generally tested; the Pewaukee and Stark have fruited in several localities, and the reports are generally favorable. Walbridge, Gideon, and Clayton are also new sorts, and although nothing can be stated with certainty, it would seem safe to try the Walbridge and Clayton in an experimental way, in all except the northern counties, while the Gideon, from its origin, should be as well adapted as any variety to the northern half of the southern peninsula.

It is hoped that some of the better of the Russian varieties will be found valuable for that section. We have about one hundred varieties here at the college, and a similar collection at Grayling, Crawford county, besides smaller numbers at various points in that section.

Upon the thin sand of the Jack-pine plains they have grown for three years without injury either from the cold of winter or the drought of summer. Some of those first planted at the college gave a few fruits in 1893, and among these the Charlottenthaler seems particularly valuable as an early summer variety. The tree is an early bearer; the fruit is large, light lemon yellow in color, and, although rather acid, it is of a pleasant flavor; it seems well worthy of a place in a collection intended for supplying fruit for a local market.

It should be stated that had the returns been accurately canvassed Fameuse would have been in the double-star list, but its seedling, Shiawassee, has all of its good qualities and is, moreover, a better growing and more productive tree, and the fruit is but little injured from the scab which in some seasons nearly ruins the Fameuse. The growers familiar with both varieties in every case marked the Shiawassee with two and Fameuse with a single star. As the Shiawassee can not always be obtained from nurseries, many planters will find the Fameuse useful to plant in its stead. (Among the nurserymen who have a stock of this valuable sort are Buttrick & Watterson of Cascade, Mich.)

The Keswick seems to be quite a sure bearer, even in off years, and it is particularly valuable as a fall variety for cooking purposes, since it remains for a long time in season.

There is often a good local market for apples, and a collection suitable for that purpose may be desired by some planters. The varieties to be used should be selected with rather more regard to productiveness and high color than those designed for home use. Such varieties as Red Astrachan, Oldenburgh, Shiawassee, Twenty Ounce, Jonathan, Hubbardston, Baldwin, King, and Northern Spy, if planted in rather larger numbers than when intended for home consumption only, would furnish a supply for sale.

In planting an orchard to secure fruit for shipment it is unwise to

choose too many varieties, and one should be guided largely in his selection by the kinds that succeed best in his locality.

They should be productive, of good size and color, and of, at least, fair quality. In nearly all parts of the State, where they are sufficiently hardy, the Baldwin and Northern Spy are valuable for planting in commercial orchards, although the latter is a long time coming into bearing. The Ben Davis is also largely planted, although it, as grown here, is much inferior to the same variety grown in Missouri and Illinois. Hubbardston and Westfield are much prized for their quality. Red Canada is very popular as a market sort in the central and eastern part of the state, its productiveness, high color, and good quality making it especially desirable. In the northern counties, especially along the west side of the state, Wagener is in high esteem. Further south it is less valued, as, unless thinned and given high cultivation, the fruit is small and the trees short-lived from their tendency to overbear. Of the varieties for winter use, none are more profitable than Tompkins King, although with good care the Jonathan in many localities is preferred, as its medium size, rich color, and high quality make it sought for as a dessert apple and for sale at street fruit stands. Grimes Golden is also profitable in nearly all parts of the state. In planting a commercial orchard one should select the two or three sorts that do best in his locality.

Of the new sorts that do not appear in the fruit list the Sutton is well worthy of trial. It has long been grown in Massachusetts under conditions much like those in this state and it is there highly valued as a variety for both home use and market on account of its hardness, productiveness, and the high color and quality of the fruit. Among the other varieties that are desirable from their behavior elsewhere are Princess Louise, Early Colton, and Carlough (sweet).

## CRAB APPLES.

While this fruit is commonly grown for home use and local market, the quantity shipped is comparatively small. Little attention has been paid to the introduction of new varieties and, of those given in the following list, the Whitney is the only one that has not been in general cultivation for many years. As will be seen from the list, the Hyslop and Transcendent are best known. The Montreal Beauty and Whitney are also desirable sorts.

## APPLES.—CRABS.

Names.	Description.							Value.				
	Size.	Form.	Color.	Quality.	Use.	Season.	Origin.	Southern Lake Shore.	Northern Lake Shore.	Southern Michigan.	Central Michigan.	Northern Michigan.
Hyslop.....	l	r	r	g	F M	A	Am.	**	**	**	**	**
Montreal Beauty.....	l	r ob	y r	g	F M	A	Am.	*	*	*	*	*
Red Siberian.....	m	r	r	g	F M	A	F.	*	*?	*?	*?	*
Transcendent.....	l	r ob	y r	g	F M	A	Am.	---	*	**	**	**
Whitney.....	l	r fl	r	v g	M	S	Am.	*	*	*	*	*
Yellow Siberian.....	m	r	y	g	F M	A	F.	---	---	*	---	*

## APRICOTS AND NECTARINES.

In most parts of the state these fruits are not successfully grown as, if the blossoms escape the early spring frosts, the trees are short-lived. Along the west shore, however, and in favorable locations in Southern Michigan, fairly good results are obtained, particularly with apricots. The varieties mentioned in the list are among those best known, but for commercial planting it is probable that the apricot known as Harris, which is proving very profitable in New York, will be preferable; the Acme is another sort that seems worthy of trial. From the behavior of the Russian apricots it is doubtful if any of them are desirable for planting.

## APRICOTS.

ABBREVIATIONS.—Size—l, large; m, medium; s, small. Form—r, roundish; r f, roundish flattened; r o, roundish oval; ob c, oblong compressed. Color—y o, yellow, shaded to deep orange in the sun; o r, orange with red cheek; o, orange. Quality—g, good; v g, very good; b, best. Use—All apricots being valued for the dessert, the letter F will signify that it is extra for the dessert, and F M that it is valued for the dessert and at the same time profitable for market. Season—E, early; M, medium; L, late in season of ripening. Origin—F, foreign; Am, American.

Names.	Description.							Value.			
	Size.	Form.	Color.	Quality.	Use.	Season.	Origin.	Southern Lake Shore.	Northern Lake Shore.	Southern Michigan.	Central Michigan.
Breda.....	m	r	o	v g	F M	E	F.	**	**	**	**
Early Golden.....	s	ro	o	v g	F M	E	F.	**	**	**	**
Moorpark.....	l	r	yo	b	F M	L	F.	**	**	**	**

## NECTARINES.

Names.	Description.							Value.			
	Size.	Form.	Color.	Quality.	Use.	Season.	Origin.	Southern Lake Shore.	Northern Lake Shore.	Southern Michigan.	Central Michigan.
Boston.....	l	ro	or	v g	F	M	Am.	**	**	**	**
Early Violet.....	l	r	or	b	F	F	F.	**	**	**	**
Stanwick.....	l	ro	or	g	F	L	F.	**	**	**	**

## BLACKBERRIES.

As with many other fruits, the varieties of blackberry that are best in size and flavor are deficient in hardness. Where this quality is necessary to a high degree, recourse to such sorts as Stone and Snyder will be necessary. In most parts of the state, however, the Taylor will succeed and will be found preferable to those sorts, so far as size is concerned. The Agawam is in every way a desirable sort except that it has strong curved spines, that render picking unpleasant. Erie, Kittatinny, Lawton, Wilson, and Wilson Junior will be found excellent sorts where they have the necessary hardi-

ness. Although so deficient in hardiness as to require laying down in winter, the Early Harvest is very largely grown as a commercial variety in Berrien county, and its productiveness and earliness make it a very profitable sort.

## BLACKBERRIES.

ABBREVIATIONS.—Size—l, large; m, medium; s, small. FORM—ob c, oblong conic; r c, roundish conical or oval; ob ov, oblong oval. COLOR—b, black. QUALITY—g, good; v. g., very good; b, best. USE—F M, family and market; M, market. SEASON—M, medium; E, early; L, late. ORIGIN—Am, American; F, foreign.

Names.	Description.							Value.				
	Size.	Form.	Color.	Quality.	Use.	Season.	Origin.	Southern Lake Shore.	Northern Lake Shore.	Southern Michigan.	Central Michigan.	Northern Michigan.
Agawam								*		*?	*	
Ancient Briton	l	ob ov	b	v g	F M	M	Am.	*		*?	*	
Early Harvest	m	ov	b	g	F M	VE	Am.	*		*	*	
Erie	l	ob ov	b	g	F M	M	Am.	*	*?	*?	*?	
Kittatinny	l	r c	b	b	F M	M	Am.	*	*	*	*	
Lawton	l	ov	b	g	M	L	Am.	*	*?	*?	*?	
Lucretia	l	ob ov	b	v g	F M	VE	Am.	*				
Minnewaski	l	ov	b	g	M	E	Am.	*		*?	*	
Snyder	m	r ov	b	v g	F M	M	Am.	**	**	**	**	*
Stone (Hardy)	l	ob	b	g	F		Am.	*	*?	*?	*?	*
Taylor, Taylor's Prolific	l	ob ov	b	g	F M	M	Am.	**	*	**	**	*
Wachusett	m	ob ov	b	v g	F M	M	Am.		*?	*?	*?	
Western Triumph	m	ob ov	b	g	F M	M	Am.			*	*	
Wilson	l	ob ov	b	v g	M	E	Am.	*	*?	*	*?	
Wilson Junior	l	ob ov	b	v g	M	E	Am.	*	*?	*	*?	

## CHERRIES.

As noted in the accompanying bulletin by Prest. Lyon the sweet cherries are, as a rule, short-lived in Michigan, although the method of training and handling them that he recommends will undoubtedly prolong their life. Black Tartarian, Gov. Wood, Yellow Spanish, and Napoleon easily stand at the head of the list. Windsor is highly commended in some places but seems to be lacking in hardiness in others. Among the varieties in the Duke and Morello class, Early Richmond, May Duke, Large Montmorency, and Morello seem most generally successful, although Late Duke, Royal Duke, and Olivet thrive wherever they have been grown.

In localities where hardiness is desirable the Wragg, Ostheim, and Brusseler seem worthy of trial. The Vilne Sweet has fruited this year and seems to be the equal of the Gov. Wood in every respect and is said to be much superior in hardiness.

For the most part the cherry is troubled by the same insects and diseases as the plum and the treatment recommended in Bulletins 103 and 104 will be found useful.

## CHERRIES.

ABBREVIATIONS.—SIZE—l, large; m, medium; s, small. FORM—ob h, obtuse heart shape; r ob h, roundish obtuse heart shape; r h, roundish heart shape; r, roundish or round. COLOR—l r, lively bright red; d r, dark red, almost black; a m, amber mottled with red; y r, yellow ground shaded and marbled with red. USE—F, family, for dessert; F M, family or market; K M, for cooking or market; M, market. SEASON—E, early; M, medium; l, late. ORIGIN—F, foreign; Am., American.

Names.	Description.						Value.				
	Size.	Form.	Color.	Use.	Season.	Origin.	Southern Lake Shore.	Northern Lake Shore.	Southern Michigan.	Central Michigan.	Northern Michigan.
<i>Heart and Bigarreau Cherries—</i>											
Bigarreau, <i>Yellow Spanish</i> .....	l	ob h	y r	F M	M	F.	*	*	*	*	-----
Black Eagle.....	l	ob h	d r	F M	M	F.	*?	*?	*?	*?	-----
Black Heart.....	l	r h	d r	F M	M	F.	*?	*?	*?	*?	-----
Black Tartarian.....	l	r h	d r	F M	M	F.	**	**	**	**	-----
Downer Late.....	m	r h	y r	F M	L	Am.	*	-----	-----	*?	-----
<i>Early Purple</i> .....											
Elton.....	m	r h	d r	F M	E	F.	*	*?	*?	*	-----
Governor Wood.....	l	r h	y r	F M	M	F.	*	*	*?	*?	-----
Napoleon.....	l	r h	y r	F M	M	Am.	**	**	**	**	-----
Rockport.....	l	r ob h	y r	F M	M	F.	*	*	*	*	-----
Windsor.....	l	r ob h	a m	F M	E	Am.	*	*?	*?	*	-----
Windsor.....	l	r h	d r	M	L	Am.	†	†	†	-----	-----
<i>Duke and Morello Cherries—</i>											
Carnation.....	m	r	a m	K M	L	F.	*?	-----	*?	†	-----
Early Richmond.....	s	r	l r	K M	E	F.	**	**	**	**	-----
Eugenie <i>Empress Eugenie</i> .....	m	r ob h	d r	F M	M	F.	*	*	*?	*	-----
Hortense.....	l	r	l r	F M	L	F.	*?	*	*?	*	-----
<i>Late Duke</i> .....											
Late Kentish.....	l	ob h	d r	K M	L	-----	*	*	*	*	-----
Late Kentish.....	m	r	r	K	M	F.	*	-----	*?	**	-----
Lonia Phillippe.....	l	r	d r	K M	L	F.	*	-----	-----	*	-----
Magnifique.....	l	r h	l r	K M	L	F.	*	*	*?	*	-----
May Duke.....	l	r ob h	d r	K M	E	F.	**	**	**	**	-----
<i>Montmorency, Large</i> .....											
Morello, <i>English Morello</i> .....	l	r	d r	K M	M	F.	**	*	*	**	-----
Morello, <i>English Morello</i> .....	l	r h	d r	K M	L	F.	**	**	**	**	-----
Olivet.....	l	r	r	F	M	F.	-----	*?	*?	*	-----
Royal Duke.....	l	r	d r	K M	M	F.	*	*	*	*	-----

## CURRANTS.

The notes upon these fruits in the South Haven report are very complete and little more need be said. Although the Cherry, Fay, and Versailles produce much larger fruit than the Red Dutch, Victoria, and Prince Albert, they are so infested with borers that the latter will be found much more reliable. The Prince Albert in particular should be commended, as it is but little troubled by currant worms, and carries its fruit until all other varieties are gone.

## CURRANTS.

ABBREVIATIONS.—Size—l, large; m, medium; s, small. FORM—with reference to form of bunch—l, long; v l, very long; s, short; m, medium. COLOR—r, red; b, black; w, white. QUALITY—a, acid; m a, moderately acid; v a, very acid. USE—K M, kitchen and market; F M, family and market; M, market. SEASON—E, early; M, medium; L, late. ORIGIN—Am, American; F, foreign.

Names.	Description.							Value.				
	Size.	Form.	Color.	Quality.	Use.	Season.	Origin.	Southern Lake Shore.	Northern Lake Shore.	Southern Michigan.	Central Michigan.	Northern Michigan.
Black Naples.....	l	s	b	m a	K M	M	F.	*	*	*	*	*
Cherry.....	l	s	r	v a	M	M	F.	*	*	*	*	*
Pay.....	l	l	r	m a	F M	M	Am.	*	*	*	*	*
Lee.....	l	l	b	m a	F M	M	F.	*	*	*	*	*
Prince Albert.....	l	l	r	m a	M	L	F.	*	*	*	*	*
Red Dutch.....	m	m	r	m a	F M	E	F.	**	**	**	**	**
Versaillaise.....	l	s	r	a	M	M	F.	*	*	*	*	*
Victoria, <i>Raby Castle</i> .....	l	v l	r	a	F M	L	F.	**	**	**	**	**
White Dutch.....	m	l	w	m a	F M	E	F.	**	**	**	**	**
White Grape.....	m	l	w	m a	F M	E	F.	*	*	*	*	*

## GOOSEBERRIES.

The Downing is as yet the variety for market, although Smith, Houghton, and Pale Red are largely grown. The Industry has been extensively advertised and quite generally planted, but except in a very few localities it has been a failure. The plant is a poor grower except in cool, moist soils, and the leaves and fruits are much injured by mildew. The use of fungicides will suffice to hold this disease in check. Red Jacket is the most promising of the new sorts.

## GOOSEBERRIES.

ABBREVIATIONS.—Size—l, large; m, medium; s, small. FORM—r, round; o, oval; r o, roundish oval. COLOR—r, reddish, when fully ripe; g, greenish yellow, when fully ripe. QUALITY—g, good; v g, very good; b, best. USE—K, Kitchen; M, market. SEASON—E, early; M, medium; M L, medium late. ORIGIN—Am, American; F, Foreign.

Names.	Description.							Value.				
	Size.	Form.	Color.	Quality.	Use.	Season.	Origin.	Southern Lake Shore.	Northern Lake Shore.	Southern Michigan.	Central Michigan.	Northern Michigan.
Downing.....	m	r o	g	v g	K	M L	Am.	**	**	**	**	**
Houghton.....	s	r o	r	g	K M	E	Am.	*	*	*	*	*
Industry.....	l	r o	r	v g	K	M	F.	*?	*?	*?	*?	*?
Smith, <i>Smith's Improved</i> .....	l	o	g	v g	K M	M	Am.	*	*	*	*	*

## GRAPES.

Not less than fifty varieties of this fruit are brought out each year, and the list has become so loaded down that many of the best varieties are buried out of sight. Worden and Concord are still our best black grapes,

and Delaware leads the list of the reds, followed closely by Salem, one of the Rogers hybrids. In some sections, however, the Brighton is preferable to either of these sorts, but, in many localities, it is so subject to mildew that it is not held in high esteem. Of the white varieties, the Niagara stands at the head of the list. Although not universally successful, it is very productive in the grape-growing districts, and the large size of the bunches and the quality of the fruit make it readily salable at a remunerative price. Winchell (Green Mountain) of the new grapes is certainly an acquisition as an early white variety, while Colerain is very promising.

## GRAPES.

ABBREVIATIONS.—SIZE—with reference to the berry; l, large; m, medium; s, small. FORM—with reference to the bunch and berry; s r, short bunch, round berry; l r, large and round; m r o, medium bunch, roundish oval berry; m r, medium bunch, round berry. COLOR—b, black, or nearly so when fully ripe; r, reddish or copper-brownish red; g, greenish white or yellowish. QUALITY—g, good; v g, very good; b, best. USE—T, table; M, market; W, wine. SEASON—E, early; M, medium; L, late. ORIGIN—The species to which each variety belongs is designed as follows: Lab., *Labrusca*; Est., *estivalis*; Rip., *riparia*; Vulp., *vulpina*. An x after one of the species denotes a cross with a variety of some other species. Hyb., hybrid, between a foreign variety and one of the native species.

Names.	Description.							Value.				
	Size.	Form.	Color.	Quality.	Use.	Season.	Origin.	Southern Lake Shore.	Northern Lake Shore.	Southern Michigan.	Central Michigan.	Northern Michigan.
Agawam	l	s r o	r	g	T M	M	Hyb.	*	*	*	*	-----
Barry	l	r		g	T M	M	Hyb.	*	*	*	*	-----
Brighton	l	d p	b	v g	T	E	Hyb.	*	*	**	**	-----
Catawba	l	m r o	r	b	TMW	L	Lab.	*?	*?	*?	*?	-----
Concord	l	l r	b	g	TMW	M	Lab.	**	**	**	**	**
Delaware		s r	r	b	TMW	M	x?	**	**	**	**	**
Diana	m	s r o	r	v g	T M	L	Lab.	*	*?	*?	*?	-----
Empire State	s	r	w	v g	T M	M	Hyb.	*	*?	*	*	-----
Eumelan	m	r	b	v g	T	M	Lab.	*?	*?	*?	*?	-----
Goethe	l	l r o	g	v g	T W	L	Hyb.	*?	-----	*?	-----	-----
Hartford ( <i>Prolific</i> )	l	m r o	b	g	M	E	Lab.	*?	*?	*?	*?	*
Hayes	m	s r	w	v g	T M	M	Lab.	*?	-----	*?	*?	-----
Herbert	l	l r	b	v g	T M	M	Hyb.	*?	-----	*?	*?	-----
Iona	m	m r o	r	b	TMW	L	Lab.	*?	-----	*?	-----	-----
Ives	m	m r o	b	g	M W	M	Lab.	*?	*?	-----	*?	-----
Jefferson	m	m r	r	v g	T M	M	Hyb.	*?	-----	*?	*?	-----
Lady	l	r	w	g	T M	E	Lab.	*	*	*	*	-----
Lindley	m	m r o	r	g	T M	M	Hyb.	**	*	*	*	-----
Massasoit		m r	r	g	T M	M	Hyb.	*	*?	-----	*	-----
Merrimac		s r	b	g	M	M	Hyb.	*	-----	*	-----	-----
Moore Early	l	r	b	g	T M	V E	Lab.	*	*	**	**	**
Niagara	l	r	w	g	T M	M	Lab.	**	*	**	**	**
Pocklington	l	l r	w	g	T M	M	Lab.	*	-----	*	*	-----
Prentiss	m	m r	w	v g	T M	M	Lab.	*	-----	-----	*	-----
Salem	l	r	b	g	M	M	Hyb.	**	*	**	**	-----
Vergennes	s	l r	p	v g	T M	E	Lab.	*	*	*	*	-----
Wildor	l	l r	b	v g	T M	M	Hyb.	*	*?	*?	*	-----
Worden	l	r	b	g	T M	E	Lab.	**	**	**	**	**
Woodruff	l	m r	r	g	M	M	Hyb.	*	-----	*	*	-----
Wyoming	m	m r	r	g	M	M	Lab.	*	-----	*	*	-----

While the above varieties are sufficient to cover the season of ripening, and embrace the leading commercial sorts, some growers may wish for a somewhat longer list, and for them the following additional kinds would be desirable: Agawam, Barry, Empire State, Lady, Lindley, Massasoit,

Merrimac, Moore's Early, Pocklington, Vergennes, Wilder, Woodruff, and Wyoming. Hartford and Ives are sometimes of value. The other varieties in the list have been given \*? in nearly every section and, while several of them, as Catawba, are among our best grapes where they thrive, they succeed in very few sections of Michigan. For notes upon these and many other sorts, reference is given to our South Haven Bulletin.

## PEACHES.

In the peach list, the varieties with two stars will make up a good collection for market purposes and the addition of a few sorts of rather higher flavor from the single star group, such as Mountain Rose and Oldmixon, will give one as good as can be selected for home use. As this fruit has been treated at length in Bulletins 103 and 104 nothing more need be said here.

## PEACHES.

ABBREVIATIONS.—SIZE—l, large; m, medium; s, small. CLASS—F, freestone; C, clingstone. COLOR—relative to the flesh, w, white or pale color; y, yellow or yellowish; g, greenish white, red at stone. QUALITY—j v, juicy vinous; m j r, melting, juicy, rich; s j, sweet, juicy; s j h, sweet, juicy and high flavored. GLANDS—s, serrated, without glands; g, glands, globose; r, glands, reniform. SEASON—E, early; M, medium; L, late; V E, very early; V L, very late. ORIGIN—Am, American; F, foreign.

Names.	Description.							Value.			
	Size.	Class.	Color.	Quality.	Glands.	Season.	Origin.	Southern Lake Shore.	Northern Lake Shore.	Southern Michigan.	Central Michigan.
Alexander.....	m	F	w	s j	g	V E	Am.	*?	*	*	*
Barnard.....	m	F	y	j v	g	E	Am.	**	**	**	**
Beer's Smock.....	l	F	y	j v	g	L	Am.	*	*	*	*
Bronson.....	m	F	y	j v	g	L	Am.	**	**	**	**
Crawford Early.....	l	F	y	j v	g	M	Am.	*	*?	*	*
Crawford Late.....	l	F	y	j v	g	L	Am.	*	*?	*	*
Early Michigan.....	m	F	w r	j v	g	E	Am.	**	**	**	**
Elberta.....	l	F	y	m j r	g	M	Am.	*	*	*	*
Engle Mammoth.....	l	F	y	m j	g	M	Am.	**	**	**	**
Foster.....	l	F	y	j v	g	L	Am.	*	*?	*?	*?
George IV.....	m	F	y	m j r	g	M	Am.	*?	---	*?	*?
Gold Drop.....	m	F	y	j v	g	V L	Am.	**	**	**	**
Hale.....	m	F	w	m j r	g	V E	Am.	**	*	*	*
Hill's Chili.....	m	F	y	j r	g	L	Am.	**	*	*	*
Kalamazoo.....	m	F	y	m j r	g	L	Am.	**	**	**	**
Large Barnard.....	l	F	y r	j r	g	M	Am.	*	**	*	*
Large Early York.....	m	F	w	s j h	g	V E	Am.	*	*	*	*
Lewis.....	m	F	w	m j r	g	E	Am.	**	**	**	**
Mountain Rose.....	m	F	w	s j	g	M	Am.	*	*	*	*
Oldmixon Free.....	l	F	g	s j h	g	M	Am.	*	**	**	**
Oldmixon Cling.....	l	C	w	m j r	g	M	Am.	*	*	*	*
Red Cheek Melocoton.....	l	F	y	j v	g	M	Am.	*	*	*	*
Richmond.....	m	F	w	m j	g	M	Am.	*	*	*	*
Rivers (Early Rivers).....	l	F	p y	m r	r	E	Eng.	*	*	*	*
Saint John.....	l	F	y	s j	g	V E	Am.	*	*	*	*
Salway.....	l	F	y r	m j	r	M	Am.	*	*?	*	*?
Smock.....	l	F	y	j v	r	L	Am.	**	**	**	**
Snow's Orange.....	m	F	y	m j	r	M	Am.	**	**	**	**
Stump the World.....	l	F	w	s j h	g	L	Am.	*	*	*	*
Susquehanna.....	l	F	y	s j v	g	M	Am.	*	---	*?	*?
Yellow Rarripe.....	l	F	y	j v	g	E	Am.	*	*	*	*

## PEARS.

While many commercial pear-growers make a specialty of some one variety that seems particularly suited to their soil or method of handling, others select such sorts as will give them a succession throughout the season, and as a rule they will be about the same as would be planted for family use. Pear trees are known as standards or dwarfs, the difference being due to the kind of root upon which they have been worked; in one case they are budded upon seedling pear stocks while, in the other, quince stocks have been used. Dwarfs are seldom used in commercial orchards although, if the branches are cut in annually, so that they will correspond with the area of the roots, and the trees are given plenty of plant food and thorough cultivation, they will be found quite profitable.

Reference to the "value" column of the pear list will show that the Bartlett and Anjou stand high in the estimation of fruitgrowers, both of them receiving double stars in every section of the state. The first is a well-known sort that succeeds everywhere, but the other is not so well-known. It grows and fruits well, both as a standard and a dwarf, and is one of the most valuable sorts both for home use and market.

The varieties that come next in general favor are Bosc, Clapp's Favorite, Flemish Beauty, Howell, Seckel, and Sheldon. The Bosc stands very close to the Anjou as a variety for either home use or market; coming between that variety and Bartlett, it is well worthy of a place upon every list. Clapp's Favorite is liable to rot at the core unless it is picked early and ripened in a warm room; while a productive variety, it is not as valuable as the kinds above mentioned, and although a few trees may be desirable it is not worthy of extensive planting. Flemish Beauty succeeds well in some localities and contests with the Bartlett for supremacy in its season. In other sections it is so subject to scab and cracking that it is not appreciated. With a proper use of Bordeaux mixture, fairly good results can be obtained with this sort in nearly all localities.

The Howell is one of the most desirable of autumn pears for market, in particular, and is worthy of a place upon the list for home use. The Seckel and Sheldon are well-known and valuable varieties, but they require (the Seckel particularly) thorough cultivation and high manuring if large, perfect fruits are to be obtained. Onondaga in some respects resembles Bartlett, but it is later and a good market sort. Lawrence follows Anjou and is excellent for early winter use.

Of the varieties particularly desirable for market sorts are Kieffer and Clairgeau. In the southern part of the state these varieties, when well ripened, have a ready sale for cooking purposes and have been found quite profitable.

The Angouleme (Duchess) has quite generally been given two stars, and when grown as a dwarf it is certainly worth planting, as the fruit is large, of fair quality, and produces in abundance. The Louise Bonne is another sort that should always be grown as a dwarf, while Anjou, Bosc, Howell, and Seckel do well that way.

Of the other varieties that are worth a place in the list, Boussock, Buffum, Josephine of Malines, Lawrence, Lucrative, Madeleine, Onondaga, Osband, Sterling, Stevens' Genesee, Sumner Doyenne, Tyson, Vicar, and Winter Nelis are most valuable. As a list that gives a succession through the season the following is submitted: Sumner Doyenne, Sterling, Clapp's

Favcrite, Bartlett, Howell, Onondaga, Bosc, Sheldon, Anjou, and Lawrence.

Of the varieties of pear recently placed upon the market, the best known are Idaho, Wilder, and Vermont Beauty. While they have not been sufficiently tested in Michigan to warrant an opinion of their value, it may be well to state that the Idaho is almost identical with Sheldon, while the other two resemble Seckel, the former being earlier and the latter later than that variety.

## PEARS.

ABBREVIATIONS.—SIZE—s, small; l, large; m, medium. FORM—p, pyriform; r o p, roundish obtuse pyriform; r a p, roundish acute pyriform; ob p, obtuse pyriform; ob o p, oblong obtuse pyriform; r, roundish; r ob, roundish obtuse. COLOR—y g, yellow or yellowish green with a red or russet red cheek; y r, yellow and russet; y, when mostly yellow or yellowish. QUALITY—g, good; v g, very good; b, best. USE—F, valuable family dessert; K M, kitchen and market; F M, family and market. SEASON—S, summer; L S, late summer; A, autumn; E A, early autumn; L A, late autumn; W, Winter. ORIGIN—Eng., English; Am., American; F, French; Fl, Flemish; B, Belgium; H, Holland.

Names.	Description.							Value.				
	Size.	Form.	Color.	Quality.	Use.	Season.	Origin.	Southern Lake Shore.	Northern Lake Shore.	Southern Michigan.	Central Michigan.	Northern Michigan.
Angouleme ( <i>Duchess</i> ).....	l	ob o p	y	v g	F M	A	F.	**	*	**	**	**
Anjou, <i>Beurre d' Anjou</i> .....	l	ob p	y g	v g	F M	L A	F.	**	**	**	**	**
Bartlett.....	l	ob o p	y	v g	F M	L S	Eng.	**	**	**	**	**
Bloodgood.....	m	r	y r	v g	F		Am.	*	*?	*?	*?	*
Bosc, <i>Beurre Bosc</i> .....	l	p	y r	b	F M	L A	B.	*	*	**	**	*
Boussock.....	l	r o p	y r	v g	F M	E A	B.	*	*	*	*	*
Brandywine.....	m	r ob	y g	v g	F M	S	Am.	*?	*	*	*	*
Buffum.....	m	r o p	y g	g	M	E A	Am.	*	*	*	*	*
Clairgean.....	l	p	y r	g	M	L A	F.	*	*	*	**	*
Clapp's Favorite.....	l	ob o p	y g	v g	F M	S	Am.	*	*	*	**	**
Dana's Hovey.....	s	r ob p	y g	b	F	W	Am.	*	*	*	*	*
Diel.....	l	r ob p	y r	v g	F M	L A	B.	*	*	*	*?	*
Easter Beurre.....	l	r ob p	y r	v g	F	W	B.	*?	*	*	*	*
Flemish Beauty.....	m	r ob p	y g	v g	F M	E A	B.	*	*	**	**	*
Giffard.....	l	p	y g	v g	F M	S	F.	*?	*	*?	*?	*
Glout Morceau.....	l	ob p	y	g	F	L A	F.	*	*	*?	*?	*
Gray Doyenne.....	m	r	y r	b	F M	L A	F.	*	*	*?	*?	*
Hardy, <i>Beurre Hardy</i> .....	l	ob p	y g	v g	F M	E A	F.	*?	*?	*?	*?	*
Howell.....	l	r p	y g	v g	F M	E A	Am.	*	*	*	*	*
Josephine of Malines.....	m	r ob p	y r	v g	F M	W	F.	*	*	*	*	*
Kieffer.....	l	r o p	y r	g	K M	A	Am.	*	*	*	*	*
Lawrence.....	m	r o p	y r	v g	F M	W	Am.	*	*	*	*	*
Louise Bonne of Jersey.....	l	ob p	y g	v g	F M	E A	F.	*	*	*	*	*
Lucrative.....	m	ob r	g y	b	F	E A	Fl.	*	*	*	*	*
Madeline.....	m	p	y g	v g	F M	S	F.	*	*	*	*	*
Manning Elizabeth.....	s	ob p	y r	v g	F	S		*?	*	*?	*?	*
Mount Vernon.....	m	r o p	y r	v g	F M	L A	Am.	*?	*?	*?	*?	*
Onondaga, <i>Swan's Orange</i> .....	l	ob p	y g	v g	F M	L A	Am.	*	*	*	*	*
Osband Summer.....	s	r p	y g	v g	F	S	Am.	*	*	*	*	*
Pound.....	l	p	y	g	K M	W		*	*	*	*	*
Rostiezer.....	s	p	y g	b	F	S		*?	*?	*?	*?	*
Seckel.....	s	r	y g	b	F M	A	Am.	*	*	**	**	*
Sheldon.....	m	r	y g	v g	F M	A	Am.	*	*	**	**	*
Souvenir du Congress.....	l	p y r	y g	v g	F M	S	F.	*	*	*	*	*
Sterling.....	m	r	y g	v g	F M	E A	Am.	*	*	*	*	*
Stevens' Genesee.....	l	r	y	v g	F M	E A	Am.	*	*	*	*	*
Summer Doyenne.....	s	r o p	y g	v g	F	S	B.	*	*	*	*	*
Superfin, <i>Beurre Superfin</i> .....	m	r p	y r	v g	F	A	F.	*	*?	*?	*?	*
Tyson.....	m	r a p	y g	b	F	S	Am.	*	*?	*	*	*
Vicar, <i>Vicar of Winkfield</i> .....	l	p	y	g	K M	W	F.	*	*	*	*	*
White Doyenne, <i>Virgalieu</i> .....	m	ob o p	y g	b	F M	A	F.	*?	*?	*?	*?	*
Winter Nelis.....	m	ob p	y r	b	F M	W	B.	*	*	*	*	*

## PLUMS.

ABBREVIATIONS.—SIZE—l, large; m, medium; s, small. FORM—o, oval; ob, obovate; r, roundish. COLOR—g, greenish; p, purplish; r, reddish; y, yellow. QUALITY—b, best; g, good; v, very. USE—F, family; M, market. SEASON—E, early; L, Late; M, medium. ORIGIN—Am, American; F, Foreign.

Names.	Description.							Value.				
	Size.	Form.	Color.	Quality.	Use.	Season.	Origin.	Southern Lake Shore.	Northern Lake Shore.	Southern Michigan.	Central Michigan.	Northern Michigan.
<i>European—</i>												
Bavay, Bavay's Green Gage.	l	r	gy	b	F	L	F.	*	*	*	*	---
Bradshaw	l	o ob	r p	v g	F	M	Am.	**	**	**	**	**
Coe Golden Drop	l	o	y r	g	F	M	F.	**	**	**	**	**
Field	l	ro	r p	g	M	E	Am.	†	†	†	†	---
Copper	m	o	p	g	F	M	F.	†	†	†	†	---
Damson	s	o	p	g	M	L	Am.	*	**	*	*	*
Duane Purple	l	o	r p	g	F	M	Am.	*	*	*	*	*
German Prune	l	o	p	g	F	M	F.	*	*	**	*	*
Grand Duke	l	ro	p	v g	F	M	F.	†	†	†	†	*
Green Gage	s	r	gy	b	F	M	F.	*	*?	†	†	*
Imperial Gage.	m	o	gy	b	F	M	Am.	*	*	*	*	---
Italian Prune, Fellemburg	m	o	p	g	F	M	F.	*	*	*	*	---
Jefferson	l	o	y r	b	F	M	Am.	*?	*?	*?	*?	---
Lombard	m	ro	r p	g	M	M	Am.	**	**	**	**	**
MacLaughlin	l	r	y r	b	F	M	Am.	*	*	*	*	---
Moore Arctic	m	ro	p	g	F	M	Am.	---	*	*?	*	*
Pond (English)	l	o	y r	p	M	M	F.	*	**	**	**	**
Prince Englebert	l	o	p	v g	F	M	F.	---	**	*	*	*
Quackenboss	l	r	p	g	M	M	Am.	*	**	*	**	*
Shropshire Damson.	s	o	p	g	F	M	Eng.	*	**	*?	*	**
Smith Orleans	l	o	r p	v g	F	M	Am.	*	*	*	*	---
Stanton	m	ro	d p	v g	F	M	Am.	†	†	†	†	---
Washington	l	ro	gy	v g	F	M	Am.	†	†	†	†	**
Yellow Egg	l	o	y	g	F	M	---	*	*	*	*	*
<i>Japanese—</i>												
Abundance (Sweet Botan)	m	ro	p	g	F	M	Jap.	*	*	*	*	*
Botan (White)	m	ro	r p	g	F	M	Jap.	*	*?	*?	*?	---
Burbank	m	r	p	g	F	M	Jap.	†	†	†	†	---

For extended notes upon the varieties of plum reference is made to Bulletin 103.

## QUINCES.

ABBREVIATIONS.—SIZE—l, large; m, medium; s, small; v, very. FORM—o, oblate; ob, obtuse; p, pyriform; r, roundish. COLOR—g, greenish; y, yellow. QUALITY—H, half tender; T, tender. USE—F, kitchen; M, market. SEASON—E, early; L, late. ORIGIN—Am, American; F, foreign.

Names.	Description.							Value.				
	Size.	Form.	Color.	Quality.	Use.	Season.	Origin.	Southern Lake Shore.	Northern Lake Shore.	Southern Michigan.	Central Michigan.	Northern Michigan.
Apple or Orange	l	v l	y	ht	M K	E L	---	**	*	**	**	---
Champion	l	r ob p	y	t	M K	L	Am.	*	*	*	*?	---
Meech	l	ro b	y	t	M K	M	Am.	†	†	†	†	---
Rea	l	ro b	y	t	M K	E	Am.	---	*	*	*	---

## RASPBERRIES.

The varieties of sub-section 1 are not used for market purposes, but on account of their superior flavor they are valued for home consumption in the southern part of the state.

Of those in sub-section 2, Shaffer seems to be the only one that is favored. The berries are large and are produced abundantly, but their dull color and peculiar flavor are against them. In sub-section 3, Palmer seems to be the favorite for early, and Gregg for late, although Conrath, Ohio, and Souhegan had many votes. The Hansell and Marlboro seem to be well liked as early red sorts, and Cuthbert is universally favored for late. Turner is liked in the northern section because of its superior hardiness. Crimson Beauty seems also to succeed in some localities if planted with other kinds that can fertilize it.

## RASPBERRIES.

ABBREVIATIONS.—SIZE—l, large; m, medium; s, small; v, very. FORM—c, conical; o, obtuse; r, roundish. COLOR—b, black; p, purplish; r, reddish; y, yellow. QUALITY—b, best; g, good; v, very. USE—M, market; F, family. SEASON—E, early; L, late; M, medium. ORIGIN—Am, American; F, foreign.

Names.	Description.						Value.					
	Size.	Form.	Color.	Qua.	Use.	Season.	Origin.	Southern Lake Shore.	Northern Lake Shore.	Southern Michigan.	Central Michigan.	Northern Michigan.
<i>Sub-section 1.—R. Idaeus—</i>												
Clarke.....	m	r	r	g	F M	E	Am.	*	*?	*?	*?	-----
Herstine.....	l	ob c	r	v g	F M	M	Am.	*	-----	*?	*?	-----
Hudson River Antwerp.....	l	c	r	b	F M	M	Am.	*	-----	*?	*?	-----
Orange, Brinckles.....	l	c	y	b	F	M	Am.	*	-----	*?	*?	-----
<i>Sub-section 2.—R. neglectus—</i>												
Caroline.....	m	ro	y	g	F	M	Am.	*	-----	*	*	-----
Philadelphia.....	m	r	p	g	M	M	Am.	*	-----	*	*	-----
Purple Cane.....	m	r	p	g	M	M	Am.	*?	-----	*	*	-----
Shaffer.....	v l	r	p	g	F M	M	Am.	**	**	**	**	*
<i>Sub-section 3.—R. occidentalis—</i>												
Conrath.....	m	r	b	g	F M	E	Am.	*	*	**	**	-----
Doolittle.....	s	r	b	g	M	M	Am.	*	*	**	**	-----
Gregg.....	v l	r	b	g	F M	M	Am.	**	**	**	**	*
Hilborn.....	v l	r	b	g	F M	M	Am.	*	*	*?	*	-----
Johnston Sweet.....	m	r	b	v g	F M	M	Am.	*	*	*?	*	-----
<i>MacCormick, Mam. Cluster.</i>												
Nemaha.....	l	ob c	b	v g	F M	L	Am.	*	*	*	*	*
Ohio.....	m	r	b	g	F M	M	Am.	*	*	*	*	*
Palmer.....	m	r	b	g	F M	E	Am.	**	**	**	**	*
Souhegan, Tyler.....	m	r	b	g	F	E	Am.	*	*	*	*	*
<i>Sub-section 4.—R. strigosus—</i>												
Brandywine.....	m	rc	r	g	F M	M	Am.	*	-----	*	-----	-----
Cuthbert.....	l	ro	r	g	F M	M	Am.	**	**	**	**	**
Golden Queen.....	l	rc	y	v g	F M	M	Am.	*	*	*	*	-----
Hansell.....	m	rc	r	v g	F M	V E	Am.	*	-----	*	*	-----
Marlboro.....	l	rc	r	g	F M	M	Am.	*	*	*?	*	*
Turner.....	m	r	r	g	F M	E	Am.	*	-----	*	**	*

## STRAWBERRIES.

The new strawberries do not seem to have met with much favor, as there were very few votes for kinds that have been introduced less than ten years. In addition to those mentioned in the list there were a few votes for Enhance, Greenville, Beverly, Marshall, Shuckless, and Timbrell, but

it is not likely that the last three had been thoroughly tested. All of them are probably valuable sorts, if we can judge from their behavior elsewhere.

For notes upon other new sorts of raspberry and strawberry, the reader is referred to Bulletins 104 and 106.

## STRAWBERRIES.

ABBREVIATIONS.—SIZE—l, large; s, small; m, medium. SEX—B, bisexual; P, pistillate; P B, nearly pistillate. COLOR—d c, deep crimson; d s, deep scarlet; b. s, bright scarlet; w t, whitish tinted with red; l c, light crimson. FORM—r c, roundish conical; o c, obtuse conical or coxcomb form; c, conical; r, roundish; r o c, roundish obtuse conical. FLESH—s, soft; f, firm; m, medium. SEASON—Early; M, medium-L, late; E L, early to late. ORIGIN—Am, American; F, foreign.

Names.	Description.							Value.				
	Size.	Sex.	Color.	Form.	Flesh.	Season.	Origin.	Southern Lake Shore.	Northern Lake Shore.	Southern Michigan.	Central Michigan.	Northern Michigan.
Bidwell	v l	B	bs	c	f	M	Am.	*		**	*?	---
Bubach No. 5	l	B	dr	rc	m	M	Am.	**	*	**	**	**
Captain Jack	l	B	dr	rc	f	L	Am.			*	*	*
Charles Downing	l	B	ds	c	f	M	Am.	*?			*?	*?
Crawford	l	B	bc	oc	m	M	O.	*			*	
Crescent	l	P	bs	rc	m	M	Am.	**	*	**	**	**
Cumberland	l	B	bs	rc	s	M	Am.	*	**	*	**	*
Eureka	l	P	br	r	m	M	O.	*	*?	*	*	*
Gandy	m	B	br	c	f	L	Am.	*?	*	*	**	**
Haverland	l	P	rsc	oc	m	M	Am.	**	*	*	**	**
Jersey Queen	v l	P	bs	rc	f	L	Am.	*?	*?	*?	*?	---
Jessie	v l	B	bs	rc	m	M	Am.	*	*?	*?	*?	*
Kentucky	v l	B	bs	rc	f	L	Am.	*	*?	*?	*	---
Manchester	l	P	s	oc	f	M	Am.	*?	*	*?	*	*
Miner	v l	B	c	rc	m	M	Am.	*	*	*	**	*
Mount Vernon	l	B	ls	roc	m	L	Am.	*	*	*	*	*
Mrs. Cleveland	l	P	bc	rc	m	M	O.	*	*	*	*	*
Parker Earle	l	B	br	lc	f	M	Tex.	**	**	*	**	*
Pearl	m	B	br	oc	f	M	Am.	*	*	*	*	---
Sharpless	v l	B	br	oc	f	M	Am.	*	*	*	**	*
Warfield	m	P	dr	c	f	M	Ill.	**	*	**	**	*
Wilson	l	B	dc	rc	f	E M	Am.	**	**	**	**	*

In the above lists, the data regarding the size, shape, color, season, and quality of the different varieties, etc., have been taken from the last report of the American Pomological society, and the starring will be used in making up the Michigan Fruit List for the next volume, soon to be issued.

In the preparation of this catalogue, great assistance has been afforded me by the many persons who filled out and returned the circulars that were sent out. In most cases it was done so thoroughly and in such an intelligent manner that the returns were incorporated into this bulletin with a very few slight changes.

To all persons who aided in the preparation of this fruit list, the thanks of the collator are extended, for the help that was rendered and the many useful suggestions that were made.

While it is undoubtedly faulty in many particulars, it is sent out with the hope that it will be of value to prospective planters of fruit trees and plants.

## STRAWBERRIES AND RASPBERRIES.

BY L. R. TAFT AND H. P. GLADDEN.

Bulletin No. 106.—Horticultural Department.

The variety tests of the above fruits have been quite successful the past season, and we trust the results will be found useful. The soil upon which they have been grown is of a sandy nature, but it contains a considerable amount of clay; before the plants were set, it was well enriched with stable manure, and the raspberries were mulched with that material the winter after setting. A mulch of straw and marsh hay was given the strawberries late in the fall of 1892 and, just as growth was starting in the spring, it was removed, to admit of the cultivating and loosening of the soil between the rows, and was then replaced to act as a mulch and keep the berries clean. The strawberries from which the notes were taken were set in the spring of 1892, although we had another plantation, of most of the older sorts, made in 1891, which we used for comparison. The raspberries were for the most part set in 1890 and 1891; a few, however, of the newer sorts were not obtained until 1892.

The season was very favorable for the strawberry crop, although it was somewhat cut short by leaf blight and hot weather; the raspberries were considerably injured by the winter and the crop of berries was lessened by the hot, dry weather of July.

The data for the tables were obtained by or under the direction of Mr. Gladden, and many of the notes were prepared by him.

## STRAWBERRIES.

In August a bulletin was issued containing the notes on eighty new varieties, that fruited for the first time the past season. In the table below, the varieties marked with an asterisk (\*), are those described in that bulletin, and any one wishing for a further description of those sorts, except the few that are here given, is referred to Bulletin No. 100.

TABLE NO. 1.—STRAWBERRIES.

## ABBREVIATIONS.

Form.		Size.		Color.	
b, broad.	l, long.	s, small.	m, medium.	b, bright.	l, light.
c, conical.	o, oval.	l, large.		c, crimson.	r, red.
d, depressed.	r, round.			d, dark.	s, scarlet.
i, irregular.					

Variety.	Sex.	Vigor (1-10).	Date of bloom.	First ripe fruits.	Last fruits.	Productiveness (1-10).	Size.	Form.	Color.	Quality.	Firmness.
*Accomack	b	8	May 24	June 21	June 30	6	m	lc	dc	9	7
*Afton	p	10	" 25	" 19	July 10	9.5	m to l	rc	dc	9	8.5
*Alabama	b	10	" 30	" 19	June 30	5	m	rc	dc	9	9.5
Alpha	b	10	" 25	" 21	July 5	8.5	m	rc	lc	9	8
Arlington	p	9.5	" 24	" 16	July 10	9	m	rc	s	9	8
Auburn	p	9.8	" 29	" 21	" 10	8	m	oc	lc	9	8
Banquet	p	10	" 24	" 19	" 5	7	m	c	dc	9.5	6
*Beauty	b	10	" 24	" 21	" 10	9.5	l	rbc	bds	9.5	6
Beder Wood	b	10	" 24	" 17	June 30	9	s to m	r	lc	8	8
Belle	b	9.5	" 25	" 23	July 9	9	m to l	lc	bs	9	9
*Belle of Lacrosse	p	8.5	" 25	" 21	" 9	9.5	l	rbc	bds	8	8
*Beverly	p	9.5	" 25	" 21	" 10	8.5	l	rc	dc	9.5	9.5
*Bickle	b	8.5	" 24	" 19	" 8	8.5	s to m	rc	ls	7	7
Boynton	p	9.5	" 24	" 19	July 5	9	s to m	o	lc	8	8
*Brunette	b	9	" 29	" 22	July 10	8	m	rc	vdc	9.5	9
Bubach	p	9.5	" 30	" 19	" 10	8.5	l	dc	lc	9	8
*California	b	7	" 29	" 26	" 10	4	s to m	lc	bds	9.5	9
*Cameronian	b	9.5	" 29	" 25	" 8	8	m	rc	ls	7	7
*Cheyenne	p	8.5	" 25	" 21	" 10	7	m	lc	bs	9.8	9
*Clark Early	b	9.2	" 29	" 19	" 10	8.5	m to l	ro	dc	9.8	9
Clark Seedling	b	8.5	" 25	" 22	June 30	8	m to l	rc	dc	9.5	9
*Clyde	b	9.8	" 30	" 21	July 8	9.8	l to m	rc	bds	9.5	9.2
Crawford	b	9	" 24	" 22	" 9	9	s	m	rc	9	9
Crescent	p	9.4	" 30	" 18	" 5	9.5	m	rc	s	7	7
Daisy	b	8.5	" 26	" 20	" 5	8.5	m	rc	ls	8	7
*Dayton	b	9	" 24	" 21	June 30	3	s	lc	-----	9	8
Dew	b	9.4	" 31	" 26	July 6	7	l	l	dc	8	8
*Dutter	b	9	" 25	" 21	" 5	7.5	l	lc	bs	9	8.5
Eclipse	p	9.5	" 25	" 20	" 10	8.5	s to m	o	lc	9	8
Edgar Queen	b	9.2	" 25	" 21	" 10	9	m to l	irc	lc	7	8
Enhance	b	9.5	" 24	" 21	" 9	9	m to l	irc	dc	8	9.5
*E. P. Roe	b	6	" 24	" 26	" 7	5	l	bc	ls	8.5	8
Enreka	p	9.3	" 27	" 23	" 5	8	m	rc	dc	9	8
*Fairmount	b	9	" 25	" 19	" 9	9.5	l	dc	dc	9	7.5
Gandy	b	9.5	" 31	" 26	" 10	8	m to l	rbc	lc	9	8
Gen. Putnam	p	9.5	" 24	" 17	" 6	9	m to l	r	ls	8	8
*Glenfield	b	9.2	" 24	" 21	" 10	5	m	lc	dc	9	7
Great Pacific	p	9.5	" 25	" 21	" 10	9.5	m	dc	r	8	8
*Greenville	p	9.8	" 29	" 22	" 10	9.5	l	rdc	bc	8	7
*Gypsy	p	9.3	" 24	" 21	" 10	9	m	rc	dc	9	9
*Harmon	b	9	" 24	" 19	June 30	4	l	rc	vdc	9	9
*Hattie Jones	p	9.4	" 26	" 21	July 8	9.5	m to l	rbc	lsc	6	7
Haverland	p	9	" 24	" 21	" 5	9	m	lc	s	8	8
*Hermit	b	9	" 24	" 21	" 10	8	l	rc	bc	8	8
Hoard	b	8.5	" 25	" 22	" 9	9	m to l	re	lc	8	8
*Huntsman	p b	9.8	" 29	" 21	" 10	8.5	l	re	dc	9	8
*Hyslop	b	8	" 25	" 21	June 29	7	s	i	-----	8	8.5
*Iowa Beauty	b	8	" 25	" 21	July 5	7	l	re	dc	10	9
Jessie	b	8.5	" 24	" 19	" 6	8	m to l	re	dc	7	9
*Jones Seedling	b	8.8	" 25	" 21	" 7	8.5	l	de	dc	9	8.5
*Katie	b	9.4	" 29	" 21	" 10	7	l	rbc	c	8.5	7.5
King No. 2	b	9	" 26	" 20	" 5	7	m	rc	lc	8	8
*Leader	b	8.6	" 24	" 21	" 9	8.5	l	lc	bdc	9.5	9
*Leroy	p	9.4	" 24	" 18	" 5	9	l	dc	dc	8.5	8
*Leviathan	b	7.5	" 28	" 21	" 10	8.5	l	bd	ls	6	5

TABLE NO. 1.—STRAWBERRIES.—CONTINUED.

Variety.	Sex.	Vigor (1-10).	Date of bloom.	First ripe fruits.	Last fruits.	Productiveness (1-10).	Size.	Form.	Color.	Quality.	Firmness.
Lida.....	p	7.5	May 25	June 21	July 10	9	m	rc	b c	7	8
*Lillie Monroe.....	b	8.5	" 25	" 19	" 10	9	l	rc	b s	8	8
*Lincoln.....	p	9	" 25	" 21	" 10	9	m	rd c	b s	7	8
Little No. 15.....	p	9	" 24	" 19	June 30	8.5	m	rc	b c	9	8
Lovett.....	b	9	" 24	" 19	July 5	9	m	rc	b c	8	8
Lower.....	b	9.2	" 26	" 19	" 5	8	l	rc	b s	8	8
*Magnate.....	p	8.5	" 24	" 21	" 10	6	m	rc	b s	8	8.5
Michel.....	b	9.8	" 24	" 16	June 30	8	s	c	b s	7	7
Middlefield.....	b	8.5	" 20	" 21	July 8	7.5	m	c	b c	9.5	8
Miner.....	b	9.5	" 26	" 19	July 6	8.5	m to l	c	b s	8	7
Moore Early.....	b	9	" 25	" 21	" 10	8	m to l	b c	b s	8	8
Mrs. Cleveland.....	p	9.8	" 25	" 19	" 10	8	m	rb c	b s	8	8
Muskingum.....	b	9.8	" 29	" 22	" 7	9	m to l	rc	b s	8.5	8
*Mystic.....	b	9.8	" 29	" 26	" 10	6	m to l	rc	b d c	9.5	8
*Neptune.....	p	9.8	" 29	" 21	" 9	6	m to l	rc	b c	7	5
*No. 1 (Allen).....	p	8.5	" 29	" 22	" 5	9	m	rc	b c	9	9
*No. 3 (Allen).....	b	9.5	" 31	" 26	" 8	7.5	l	rc	b c	8.5	7
*No. 3 (Belt).....	b	9.2	" 25	" 26	" 10	9	l	c	b l s	8	8
*No. 2 (Cameron).....	b	9.2	" 24	" 20	" 9	8.5	m	lc	b c	9	8
*No. 6 (Cameron).....	p b	8.5	" 29	" 22	" 10	4	m	rb c	b s	8.5	8.5
*No. 13 (Cameron).....	p	7.5	" 29	" 22	" 10	8	m	rc	b c	8	7.5
*No. 1 (Engle).....	b	9	" 24	" 21	" 8	5	l	rc	b c	8	8
*No. 2 (Feicht).....	b	9	" 25	" 18	" 10	9.5	m to l	rc	b c	8	8.5
*No. 3 (Feicht).....	p	7	" 25	" 20	" 10	8	l	lc	b c	7	9
*No. 31 (Haynes).....	p	9.8	" 29	" 21	" 10	5	m	irc	b s	6	6
*No. 2 (J. S.).....	b	9	" 26	" 21	" 10	6	s to m	rc	b c	8	8.5
*No. 4 (J. S.).....	p	9	" 24	" 21	" 9	5	m	rc	b c	9	7.5
*No. 6 (J. S.).....	p	9	" 25	" 21	" 10	9.5	l	rc	b d s	7	6
*No. 18 (Little).....	b	8	" 24	" 18	" 9	8.5	m	rc	b c	8	8.5
*No. 26 (Little).....	b	8.8	" 25	" 21	" 5	9	l	i	b d c	9	8
*No. 42 (Little).....	b	8.5	" 24	" 21	" 10	9	l	rc	b c	9	8
*No. 1 (Stayman).....	p	9.5	" 29	" 22	" 6	9.5	m	ro	l s	8	8
*No. 3 (Stayman).....	b	9.8	" 25	" 21	" 10	9.5	m	lc	b c	7	8.5
*No. 34 (Thompson).....	p	8.8	" 25	" 22	" 8	5	m	rc	b c	8	8
*No. 77 (Thompson).....	b	7.5	" 24	" 19	" 7	9.5	s	lc	b c	7	5
*Odessa.....	p	9	" 29	" 23	" 7	5	l	l	b s	7	7
Ohio Centennial.....	p	9.4	" 29	" 25	" 9	9	l	b c	b s	9	8.5
*Ohio Monarch.....	b	9.8	" 29	" 23	" 10	5	l	lc	b s	9	8
Ontario.....	b	8.4	" 29	" 26	" 8	9.4	m to l	lc	b c	9	8.5
Parker Earle.....	b	9.6	" 29	" 25	" 10	9.8	m	c	b s	8.5	9.5
*Pawnee.....	b	9	" 24	" 19	" 9	7.5	l	rc	b c	9.8	7
*Primate.....	b	9.2	" 26	" 21	" 10	6	m	rc	b c	6	7
Princess.....	p	8.8	" 26	" 21	" 10	8	m to l	r	s	9	8
Sadie.....	p	9	" 24	" 19	June 30	9	m	rc	b c	9	8
Saunders.....	b	9	" 25	" 21	July 9	8	m to l	lc	b s	7	8
Sharpless.....	b	9.5	" 25	" 21	" 10	8	m	b c	b c	8	8
*Smeltzer Early.....	b	9	" 25	" 21	" 8	8.5	m	rc	b c	9	8.5
*Southard.....	b	8.8	" 22	" 16	" 4	8	l	rc	b s	7	8
*Standard.....	b	9.5	" 25	" 24	" 7	9	l	rc	b d c	9.5	7
*Stevens.....	b	9.2	" 25	" 21	June 30	9	m	rc	b c	9	8
Stimmel No. 15.....	p	8	" 24	" 19	" 30	8.5	m	b c	l s	9	8
Stimmel No. 20.....	p	8	" 24	" 21	" 30	6	s to m	lc	b c	9	8
*Surprise.....	b	9.2	" 28	" 21	July 7	6	m	lc	b s	8	8
*Swindle.....	p	9	" 26	" 23	" 5	8	m	rc	c	7	9
*Tom Walker.....	p	9.8	" 26	" 19	" 9	9	l	rc	b c	8	8
Van Deman.....	b	7	" 25	" 19	" 9	5	m	rc	lc	8	8
Westbrook.....	p	8	" 25	" 21	" 8	8	m	c	b c	8	9
*West Lawn.....	p	8.5	" 25	" 21	June 30	6	s to m	i	b s	7	7.5
*Weston.....	p	9.5	" 29	" 21	July 9	9.8	l	b c	b s	8	8.5
*Williams.....	b	8.8	" 29	" 21	" 10	8.5	l	rc	b c	8.5	9
Wilson.....	b	8.5	" 28	" 21	" 10	8	m	c	b c	8	9
Woolverton.....	b	8.5	" 29	" 21	" 10	8.5	m	lc	b c	8	9
*Yankee Doodle.....	p	9.8	" 25	" 19	" 5	9	l to m	rd c	b s	8	9

To test the comparative productiveness of a few of the leading varieties, the berries, upon rows eighteen rods in length, were picked and measured, and in the following table the crop obtained is given in quarts:

TABLE NO. 2.—YIELD FROM ONE FORTY-FIFTH OF AN ACRE.

Variety.	Dates of picking.								Total quarts.
	June 20.	June 23.	June 24.	June 27.	June 29.	July 3.	July 5.	July 7.	
Bnbach.....	5	10	7	13	8	14½	2½	¾	60¾
Haverland.....	3½	10	6	16	8	13	3	1	60½
Gandy.....		3		11	15	12	3	1½	40½
Lower.....	½	3	4½	12	11	9	2	1	43
Lida.....	1	2	4	4	14	5½	1	2	33½
Sucker State.....	1		4	3	10	4	7	½	29½
Moore.....		1½	3½	6	8	5		¾	24½

Most of the varieties were grown in narrow matted rows, with twenty-five plants in a space of forty feet.

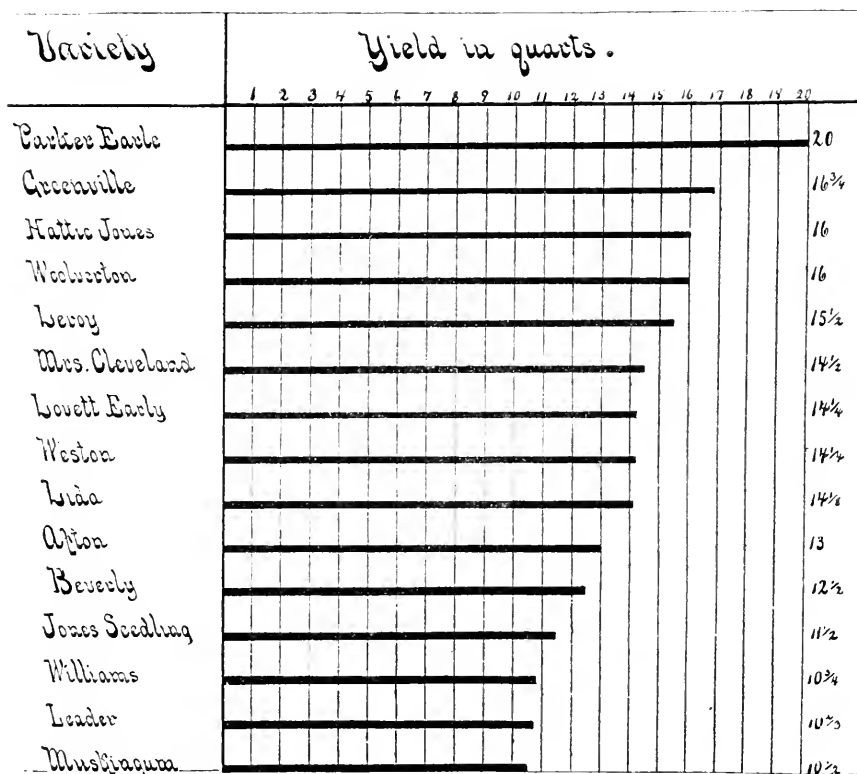
At the time of blossoming, the plot containing the new varieties was carefully gone over, and the more promising sorts were marked, that their productiveness might be accurately determined. Some varieties that were very promising early in the season were disappointing at the close, hence the variableness of the yield. The same amount of space and equal care were given to each sort. By dividing the season into three periods and giving the yield for each division of time, an attempt has been made to show which are valuable as early varieties.

TABLE NO. 3.—YIELD OF TWENTY-FIVE PLANTS IN QUARTS.

Variety.	June 21.	June 24.	June 26.	June 27.	Total yield, June 21-27.	June 28.	June 29.	June 30.	Total yield, June 28-30.	July 1.	July 3.	July 7-10.	Total yield, quarts.
Afton.....	1	4	1		6	2	2		4	2	½	½	13
Banquet.....	1¾	2	1½	1	6¼		1½	¾	2¼		¾	¾	9½
Beauty.....	1	2	2		5	1¾		1	2¾	1	¾	¾	9½
Beverly.....		2	1		3	1		4	5		1½	3	12½
Brunette.....	½	1½	1	1	3½		1¾		1¾		1	½	6¾
Greenville.....		4	4		8	2		3	5		3	¾	16¾
Gypsy.....	½	2½	2		5				0	2	¾		7½
Hattie Jones.....	1	2½	4	1	8½			4	4		2½	1	16
Huntsman.....	¾	3	3½	½	7¼		½		½		½		8¼
Jones Seedling.....	4	2	1		7			2	2		2	½	11½
Katie.....		3	2		5½	½		½	1		¾	½	7½
Leader.....	1	2½	2		5½	2½			2½	1½	¾	½	10½
Leroy.....		4	4½	1¾	9¾		2		2		3¼	½	15½
Leviathan.....	½	¾	2		3¼	1¾		1	2¾		1½	¾	7¾
Lida.....		2½	3½		5¾	1			1	5	1½	1	14¾
Lincoln.....	½	1½	2		4	1¾		1	2¾		1½	¾	8½
Lovett Early.....	1	3		6	10		1½		1½		1¾	1½	14¾
Mrs. Cleveland.....	1	4	4		9	1½			1½		2	1	14½
Muskingum.....		3	3		6						3½	½	10½
Parker Earle.....		½	1½		2	4½		6¾	10¾		2¾	4½	20
Southard.....	1	2	2	1	6		½	½	½		¾		6¾
Standard.....	½	1	2½	½	4½			3	3		1½	¾	9¼
Swindle.....	½	½	2	1	4		1¾		1¾		2	¾	8
Tippecanoe.....	1	2	2	1¾	6¼		1¾		1¾		2	½	10
Weston.....	½	2	3		5½	1		3¼	4¼		4	½	14¾
Williams.....		2	2	2	6			3	3		1½	¾	10¾
Woolverton.....		4	3½		7½		2	1	3	2	1½	2	16

In the following diagram, we have endeavored to show at a glance the relative productiveness of the varieties in the above table, selecting only those with a yield in excess of ten quarts from the forty feet of row.

TABLE NO. 4.—YIELD OF FIFTEEN SELECTED SORTS.



## NOTES UPON VARIETIES.

We append brief notes upon the vigor, productiveness, quality, and firmness of some of the more promising of the varieties of comparatively recent introduction, and refer the reader to the preceding tables for further information regarding the size, shape, and color, of their fruit and their date of ripening, etc.

*Banquet* still deserves a place as a home berry. It is handsome in appearance and of high quality, but is not productive enough for market purposes.

*Beder Wood*—In last year's report this variety, although quite vigorous and productive, was placed in the doubtful class from its low quality and lack of firmness. It is, however, the equal of *Crescent* in these respects, and except that it is likely to be injured by the leaf blight it would probably surpass that sort in vigor of plant and productiveness. Since it can be kept free from this disease, at a slight cost, by the use of fungicides, there is a promising future before it.

*Belle* should take a high place as a variety for market purposes, as it adds firmness to the other qualities desired in a profitable variety. The fruits are of good size, and are even in size, form, and color.

*Boynton* is a promising sort, so far as the vigor and productiveness of the plants are concerned, but the berries are so small that it is not likely to become a profitable variety.

*Edgar Queen* is quite vigorous in plant and above the average in productiveness; the fruits often reach a large size and, although somewhat deficient in firmness and quality, it is likely to be desirable for local marketing.

*Enhance* has again shown itself one of the best varieties for either local market or shipping purposes. In vigor of plant and in firmness it stands near the head, while it is surpassed in fruit production by very few varieties.

*Gandy* is very vigorous in plant and is valued for its large, handsome fruit, its high quality and lateness in ripening, but it is rather below the standard of productiveness.

*General Putnam* has for four years been one of the most vigorous kinds grown and, although it does not stand particularly high in quality and firmness of fruit, it is surpassed by very few sorts in productiveness. The berries are from medium to large in size and quite regular in form. Worthy of trial.

*Great Pacific*, although in fruit of only medium size and moderate firmness, is so vigorous and productive that it is likely to be well worth planting as a variety for local market purposes.

*Jessie* and *Lida* require extra care to do well, and neither has been generally profitable, but the latter in particular has given us excellent results.

*Loudon No. 15*, now named *Hoard*, is a promising market sort. The plants are strong and productive, and the berries are above the average in size and firmness, and of very good quality.

*Lovett* is not as early as was claimed by its introducer, but it is vigorous, fairly healthy, and quite productive, besides equaling, if not surpassing, the best of the old sorts in the quality and firmness of its fruit.

*Michel (Osceola)* is very vigorous in plant and is highly esteemed as a pollinizer and for early fruiting, since it furnishes a large amount of pollen, and one or two pickings can be obtained from it before other varieties are ripe. While of little value as a market sort it can well have a small place in a family collection.

*Mrs. Cleveland* is one of the healthiest and most vigorous varieties grown. The plants are quite productive and the fruits make a fair showing in quality and firmness.

*Muskingum* has been grown by us for several years under the name of *Kearns* and, although somewhat troubled by rust, it is one of our best late varieties for sale in a local market. It is one of our most vigorous kinds, besides being quite productive, of good quality, and fair firmness.

*Ohio Centennial* has for several years held a high rank for its vigor of growth, productiveness, and excellent quality, as a variety for family or local market purposes, but it is rather deficient in firmness for a shipping variety.

*Parker Earle* is by many regarded as the most valuable of the comparatively new strawberries. It makes very few plants, but sets an immense

number of fruits, and with high culture and a favorable season will ripen most of them.

*Princess* is hardly productive enough for a market berry, but its vigor and the high quality of its fruit give it a high rank among the varieties for a family collection.

*Sadie* is quite vigorous and productive; although of only medium size, its quality combined with its other good features makes it well worthy of trial, especially for home use.

*Stayman No. 1* needs only a greater degree of firmness to be near the head of the list, as in vigor and productiveness it compares well with any sort grown the past year.

*Stayman No. 3* has the vigor and productiveness of No. 1 and the fruit is fairly firm, but it lacks in flavor.

*Swindle* has qualities that would make it an excellent market sort were it not for the fact that it rusts so badly that it can not be grown to advantage, unless it is sprayed. It is a seedling of *Crescent* and resembles that variety in the shape of its fruit. The berries, however, are firmer and of larger size.

*Van Deman* made a promising showing in 1890 but since that time it has been lacking in productiveness. As this is due to a large extent to the leaf blight, the variety should not be condemned.

*Westbrook* has thus far seemed rather deficient in productiveness, but its firmness and fair quality render it worthy of further trial as a shipping variety.

*Woolverton*, which has somewhat disappointed us in past years, in vigor and productiveness, made an excellent showing this season, and if it retains these characteristics will be a valuable shipping sort, owing to its more than usual firmness.

Although a full description of the varieties that have fruited but once upon our grounds was given in Bulletin 100, it seems desirable to repeat here the description given of the half dozen most promising sorts, viz.: *Clyde*, *Greenville*, *Leroy*, No. 2 (Feicht), *Weston*, and *Yankee Doodle*.

*Clyde*. B.—Plants from Stayman & Black, Leavenworth, Kan. First received as *Cycloma*. The plants are of very strong growth; leaf-stalk long, slender; leaflets usually small, ovate; color medium green; texture papery; teeth large, rounded. First ripe fruits June 21. Crop at best June 24-26. Fruit large to medium in size, round conical, or broad conical, dark scarlet color, flesh dark; productiveness 9.8, quality 8.5, firmness 9.2.

The plants remained healthy and crop held out well to close of season; they are productive and the berries are firm. One of the most promising of the new varieties for market purposes.

*Greenville*. P.—Plants from E. M. Buechly, Greenville, Ohio. Plants of strong growth; leaf-stalk usually long, quite stout, but reclining; leaflets usually large, round-ovate, turned up at edge, dark green, texture papery; teeth large, rounded. First ripe fruits June 21. Crop at best June 26-28. Fruit large, round conical or depressed conical, sometimes ridged; color, bright crimson; flesh dark; productiveness 9.5, quality 8, firmness 7.

The plants are strong growing, healthy and productive. The crop held out well to close of season. The fruit is lacking in firmness, otherwise excellent. A promising variety for use in a local market.

*Leroy.* P.—Plants from J. H. Haynes, Delphi, Ind. Plants of strong growth; leaf-stalk of medium length, stout; leaflets medium size, narrow ovate, color dark green; texture papery; teeth large, pointed. First ripe fruits June 19. Crop at best June 24. Fruit large, depressed conical, sometimes ridged; color dark crimson; seeds prominent; flesh dark; productiveness 9, quality 8.5, firmness 8.

Plants are of vigorous growth and rust but little. The crop holds out well in size and productiveness. The fruit is not very firm but the seeds are prominent, making it a fairly good shipper. Early. Promising.

*No. 2 (Feicht).* B.—Plants from David Feicht, Little York, Ohio. Plants of strong growth, leaf-stalk usually long; leaflets of medium size, ovate; teeth sharp. First ripe fruits June 18. Crop at best June 24. Fruit medium to large in size; round conical; crimson color; flesh dark; productiveness 9.5, quality 8, firmness 8.5.

Plants strong and healthy. Crop ripened early and held out well. Its productiveness makes it promising for home use or local market.

*Weston.* P.—Plant of strong growth; leaf-stalk long; leaflets medium to large in size, broad ovate; color, dark green; texture, thin but tough. First ripe fruits June 21. Crop at best June 24-27. Fruit large, broad conical, somewhat ridged, bright scarlet color; flesh, medium dark; productiveness 9.8, quality 8, firmness 8.5.

Plants very strong and healthy. Crop held out best of any variety. Berry of attractive appearance and fair quality, seeds prominent, making it a good shipper. One of the best varieties grown here this season.

*Yankee Doodle.* P.—Plants from Geo. Q. Dow, North Epping, N. H. Plants of very strong growth; leaf-stalk varies in length; leaflets large, broad ovate; color, dark green; texture, tough. First ripe fruits June 21. Crop at best June 24. Fruit large to medium in size, round conical or depressed conical, bright scarlet color, flesh light; productiveness 9, quality 8, firmness 9. Now known as *Epping*.

Plants strong, healthy and productive. Crop held out fairly well. Promising as a market sort.

Closely following the above were the following varieties, some of which seem to have considerable value:

Afton.	Gypsy.	No. 3 (Stayman).
Beauty.	Huntsman.	Pawnee.
Belle of La Crosse.	Leader.	Smeltzer.
Beverly.	No. 1 (Allen).	Standard.
Brunette.	No. 2 (Cameron).	Stevens.
Clark (Early).	No. 26 (Little).	Tom Walker.
Fairmount.	No. 6 (J. S.).	Williams.

About forty varieties marked with asterisk (\*) in Table No. 1 seemed to have some good points, but were so deficient in others that further trial will be needed to determine their value. The list includes:

Accomack.	Leviathan.	No. 4 (J. S.).
Alabama.	Lillie Monroe.	No. 34 (Thompson).
Bickle.	Lincoln.	No. 77 (Thompson).
Cameronian.	Jones.	No. 18 (Little).
Cheyenne.	Katie.	No. 42 (Little).
Clark (Seedling).	Magnate.	No. 2 (J. S.).

Dutter.	Mystic.	Odessa.
Glenfield.	Neptune.	Ohio Monarch.
Harmon.	No. 3 (Allen).	Primate.
Hattie Jones.	No. 3 (Feicht).	Southard.
Hermit.	No. 6 (Cameron).	Surprise.
Iowa Beauty.	No. 13 (Cameron).	Westlawn.

Several varieties were so lacking in one or more of the characteristics of a good strawberry that they are placed in the following rejected list:

California.	E. P. Roe.	Nigger.
Dayton.	Estelle.	No. 1 (Engle).
Dr. Moraire.	Hyslop.	No. 31 (Haynes).

#### SUMMARY.

The old varieties Bubach, Crescent, Haverland, Warfield, and Wilson are still most commonly grown as market varieties, but the Crescent and Wilson, from their liability to injury from leaf-blight, have in some sections been superseded, respectively, by Warfield and Bubach. They are all (with the exception of Wilson) pistillate varieties, and must have perfect-flowering sorts planted with them to supply pollen. Miner, Cumberland, and Sharpless succeed in most localities and are excellent for the purpose. Wilson and Michel are also used. For home use, or for local markets, the Cumberland, Great Pacific, and Sharpless have much to recommend them. To precede these sorts by a few days, Alpha and Michel can be used, but they will be found considerably less productive than Warfield and Crescent, which follow soon.

Lovett, Mrs. Cleveland, and Townsend No. 19 are also worthy of a place among early market kinds.

It is too soon to pass upon the varieties marked with an asterisk (\*) in Table 1, but of the older and yet comparatively new sorts, the most promising for market are Belle, Crawford, Enhance, Florence, Muskingum, Ohio Centennial, Parker Earle, and Stayman No. 1. As will be seen from the table, Parker Earle leads the others in the list by several points, but it will not succeed without the best of care. For local markets the Beder Wood, Edgar Queen, General Putnam, and Hoard seem worthy of trial.

#### VARIETIES OF DOUBTFUL VALUE.

Of the older sorts, the following seem to have little to commend them, and as our lists are much too long, and as many of them, although sent out several years ago, are not generally catalogued, they will receive no further consideration: Acme, Arlington, Auburn, Bubach No. 34, Cling-to, Clinton, Cloud, D. and D., Daisy, Dubois, Howard, Lady Rusk, Little No. 5, Logan, London No. 34, Martha, Ohio, Prince (of Berries), Shaw, Tippecanoe, Townsend No. 3, Waldron, Welch, Woodruff No. 1, Yale and Zanesfield.

#### STRAWBERRY LEAF-BLIGHT OR RUST.

Although some of the varieties are so nearly exempt from this disease that the crop is not noticeably lessened by it, others are so badly injured

that what would otherwise be profitable varieties have been quite generally discarded. The disease first shows itself upon the leaves as purplish spots, these enlarge and, the center tissues being destroyed, they change to a yellowish white color. The spots are often so numerous as to destroy the leaves. The fungus also works upon, and does most injury to, the flower or fruit-stalks, as very small spots, especially upon the pedicels will serve to girdle them and thus cut off the supply of food. As a result, the berries wither and dry up. The disease is generally most troublesome upon old varieties and in plantations from which one or more crops of fruit have been taken; a dry soil and a dry season also seem to increase its effect.

While much can be done by selecting varieties as little as possible subject to scab, using plants from young plantations only, planting upon rich and fairly moist soil and conserving the moisture so far as possible by heavy mulching, or frequent shallow cultivation, it will generally pay the commercial grower, in localities where the rust is troublesome, to make use of fungicides, for the destruction of the spores of the disease, as it is now known that they are entirely efficient.

The best preparation is Bordeaux mixture prepared in the usual way, using 3 pounds of copper sulphate, 3 pounds of fresh lime, and 32 gallons of water. (If leaf-eating insects are present it will be of advantage to add 2 ounces of Paris green for their destruction.) A bearing plantation should be sprayed after the flower-stalks have developed and just before the blossoms open. This will serve to protect the fruit-stalks and will hold in check the rust upon the leaves. The young plantations should be sprayed at the same time. This will suffice for them until July, when they should receive a second and final application, but the bearing plants, if the disease is particularly destructive, will be benefited by an intermediate application soon after the fruit has set. Care should be taken not to apply Bordeaux mixture to strawberries, or other fruits, within three weeks of the time they are to be gathered, as the lime will spot the fruit and, although there may not be enough of the copper to furnish a fatal dose, it is not a desirable thing to take into the stomach.

#### RASPBERRIES.

The plants were set eight by three and one half feet, and from four to six stems were left in a hill. In June, as the young canes developed, the tips were pinched off to induce them to send out side branches. After the danger of freezing weather was over in the spring, the side shoots were cut back to lengths of from six to ten inches.

TABLE No. 5.—BLACK AND HYBRID RASPBERRIES.

ABBREVIATIONS.

Size.  
s, small,  
m, medium.  
l, large.

Form.  
r, round.  
c, conical.  
o, ovate.

Color.  
b, black. g, glossy.  
p, purple. l, light.  
o, orange. pu, pubescent

Variety.	Vigor (1-10).	Date bloom.	First ripe fruits.	Last fruits.	Productiveness (1-10.)	Size.	Form.	Color.	Quality.
Ada	7	June 14	July 14	July 24	7	m	r	f b	8.
Caroline	6	" 14	" 11	" 23	8.5	m	r	f o	8.
Columbian Red	9.5	" 12	" 16	Aug. 5	9	l	r c	p r	8.5
Conrath	9	" 7	" 17	July 24	9	l	r	b	8.
Cromwell	8.5	" 9	" 5	" 22	8.5	m	r	b	8
Farnsworth	8	" 12	" 11	" 22	8.5	m	r	b	8.5
Gregg	8.5	" 12	" 15	Aug. 5	8.5	l	r	b pu	7
Kansas	7	" 12	" 7	July 24	8.5	l	r	f b	8
Lovett	9	" 12	" 6	" 24	7	m	r	b	9
Nemaha	8.5	" 12	" 15	Aug. 4	9	l	r	b pu	7
Ohio	9	" 12	" 11	" 1	9.2	l	r	b	6
Older	7	" 12	" 9	July 24	8	l	r	b	9
Palmer	8.5	" 9	" 8	" 23	8.5	m	r	b	8.5
Progress	5	" 9	" 10	" 24	5	m	r c	b	8.5
Shaffer	9	" 14	" 16	Aug. 8	8	l	r o	p	8
Souhegan	7	" 11	" 5	July 25	9	m	r	b	8
Smith (Prolific)	7	" 12	" 11	" 24	9	l	r	b	9
Surrey	8	" 12	" 14	Aug. 5	5	m	r	b pu	7
Tyler	8	" 8	" 5	July 24	9	m	r	b	8
Virginia	9	" 9	" 11	" 24	9	l	r c	b	8.5

## NOTES ON VARIETIES.

*Conrath*.—The plants are productive and of vigorous growth. Canes somewhat injured by winter, but quite free from disease. The berry ripens early: is large, firm, and of good quality. A very promising early variety, being the largest of the early black-caps.

*Columbian Red*.—Plants from J. T. Thompson, Oneida, N. Y. It is of the Shaffer type. The canes are of very strong growth and bright red color. The berry is of the color of the Shaffer, but it is firmer, less acid, and better in flavor. Productive.

*Cromwell*.—Bushes of vigorous growth and fairly productive. Canes slightly injured by the winter. Worthy of trial as an early sort to supersede Souhegan and Tyler where they are troubled by anthracnose.

*Farnsworth*.—Plants from W. W. Farnsworth, Waterville, Ohio. It is not sufficiently tested, but it seems to be a promising early sort.

*Gregg and Nemaha*.—Among the best late, market sorts. The latter is the hardier of the two, and will be desirable where the former fails.

*Kansas*.—The canes were quite badly winter-killed, and the bushes were much less productive than last season. It is as large as Gregg and fully a week ahead of that sort in ripening.

*Lovett*.—The tips of canes winter-killed. Although it may prove more valuable than Souhegan, from its behavior thus far, it seems less desirable than Conrath and several of the other new sorts.

*Ohio*.—The bushes are vigorous and productive. One of the best medium-season, market sorts. It is too full of seeds to be the best type of berry for family use, but it has one valuable quality in its hardiness, which allows of its being grown in localities where other kinds fail. One of the surest of the black-caps. Much used for evaporating.

*Older*.—Less promising than last season, but still the equal of most sorts. Its high quality makes it valuable for home use, even if it does not prove sufficiently productive for market.

*Palmer*—Hardy. Bushes fairly vigorous and productive. This variety is highly esteemed as an early market black-cap and for this purpose it has few if any superiors.

*Progress*.—Needs further trial. Its behavior thus far does not indicate that it will take a high place.

*Shaffer*.—One of the best for home use and for market where its dull color and peculiar flavor are not distasteful.

*Souhegan and Tyler*.—The leading early, market sorts of past years. They are so badly injured by anthracnose that they are less commonly planted than formerly, Palmer taking their place.

*Smith (Prolific)*.—Plants from Ezra G. Smith, Manchester, N. Y. The first season of fruiting. Berry large, round, jet black, firm and of best quality. Very promising as a late variety so far as can be judged from a single season's experience.

*Virginia*.—One of the largest and best of the early black-caps. It has generally been quite productive, and it seems well worthy of general trial.

TABLE NO. 6.—RED RASPBERRIES.

## ABBREVIATIONS.

Size.	Form.	Color.
s, small.	r, round.	d, dark.
m, medium.	c, conical.	o, orange.
l, large.	o, ovate.	r, red.
		b, bright.
		p, purple.

Variety.	Date bloom.	First ripe fruit.	Last ripe fruit.	Productiveness (1-10).	Size.	Form.	Color.	Quality.
Brandywine.....	June 14	July 11	July 28	7	m	rc	dr	8
Cuthbert.....	" 14	" 16	Aug. 6	9	l	rc	r	8
Gladstone.....	" 12	" 7	July 24	5	l	rc	dpu	8
Hansell.....	" 12	" 3	" 22	8	m	r	dr	9
Herstine.....	" 14	" 11	Aug. 5	8	m	r	br	9.5
Marlboro.....	" 16	" 7	July 24	8	m	r	r	8.5
Michigan Early.....	" 12	" 3	" 22	9	s	r	r	9
Miller's Woodland.....	" 14	" 8	" 22	7	m	r	r	8.5
Rancocas.....	" 15	" 11	" 24	7	m	r	r	8.5
Reder.....	" 14	" 8	Aug. 5	7	m	r	r	9
Red Cluster.....	" 16	" 8	" 5	7	m	rc	r	9
Royal Church.....	" 12	" 11	" 24	8.5	l	rc	dc	8.5

## NOTES ON VARIETIES.

*Gladstone*.—The bushes bore little fruit and that was small and imperfect. Last season it promised well. Needs further trial.

*Royal Church*.—The bushes are hardy, vigorous, and productive. The berry is of handsome appearance and high quality, but falls to pieces easily.

*Hansell* and *Michigan Early* are good early varieties, and *Marlboro*, although a failure in some sections, is all that can be desired in others.

*Cuthbert* is the leading market sort and as yet has no equal as a late red raspberry for market purposes.

*Golden Queen* for home use is worthy of a place. It resembles *Cuthbert* in plant, but the berries are of superior quality and of a yellow color.

## ANTHRACNOSE.

Raspberries, both red and black, have been much troubled with this disease. As a preventive it is desirable to obtain plants from young plantations. In case the disease shows itself, the treatment should be the same as practiced at South Haven (see page 71, Bulletin 104), cutting out all badly diseased canes and spraying with Bordeaux mixture. In severe cases, an application of the fungicide should be made just before the growth starts, and should be repeated, at intervals of two weeks, after the canes start, until the fruit is half grown. As soon as the crop is harvested, remove the old canes, thin out the new ones, and spray thoroughly. While this may not be entirely effectual in keeping the disease from showing itself in an old plantation, it will prevent serious loss.

AGRICULTURAL COLLEGE, }  
February 10, 1894. }

## INSPECTION OF COMMERCIAL FERTILIZERS.

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Bulletin No. 97.—Chemical Department.

Act No. 26, session laws of 1885, provides for the inspection of commercial fertilizers in this state. The law has been in force for eight years. It was designed primarily for the protection of farmers, and secondarily to protect honorable manufacturers who place reliable goods upon the market from the competition of untrustworthy dealers who seek to place fertilizers of inferior quality upon the market and sell worthless stuff for high-priced manures. The strict enforcement of the law has driven some inferior goods out of the market, has improved the quality of many fertilizers by keeping manufacturers up to the quality claimed for their goods, and in these several ways has saved thousands of dollars to our people. Michigan has ceased to be the dumping-ground for fertilizers of so poor quality as to be unsalable in other states.

## OBJECT OF CHEMICAL ANALYSIS.

In these analyses attention is directed exclusively to nitrogen, potash, and phosphoric acid, in form available for the plant. These are not the only materials concerned in raising crops, but they are the only manurial materials for which the farmer can afford to pay more than ten dollars per ton. The common soil materials, lime, magnesia, silica, alumina, oxide of iron, etc., make up the bulk of our soils, which the farmer can not afford to buy at twenty to thirty dollars per ton to manure his fields made up of the same materials. These common soil materials, aside from nitrogen, potash, and phosphates, do not enter into consideration in making up an estimate of the value of any fertilizer.

## COMPLAINTS OF DEALERS.

A few dealers complain of the injustice of paying a license fee of twenty dollars, when the profits of the sales for a season may be little more than the license fee, and that they should not be taxed until they had established a paying business. In some states the license fee is graded by the number of tons of fertilizers sold during the year, but that is not the law in this state. Our law was planned for persons who carry on a commercial business and not a huckstering trade. If the business is too

small to justify a license it is too small for this climate. It would be manifestly unfair to allow a trade to go forward in hope of building up a paying trade in competition with dealers who have paid their license fee and demand the protection of the law.

#### MANUFACTURERS SHOULD PROTECT THEIR RETAIL DEALERS.

By the proviso to section 3 of the law, a dealer in this state is not required to take out a license for the sale of any fertilizer if the manufacturer has taken out a license for such fertilizer. In this way the manufacturer can protect all his agents in this state by payment of a single fee. Otherwise each dealer must take out a license. The object of the law is not merely to collect a revenue, but to secure the analysis and certification of every fertilizer sold in the state. If, then, any manufacturer neglects or refuses to take out a license for his goods, it would be a matter of prudence for all dealers to refuse his goods, and sell only the fertilizers of such manufacturers as will protect their agents in the state. If outside manufacturers neglect their state agents, then the law exacts the fee for license from each dealer in the state.

One Cleveland party refuses to pay for a license on nitrate of soda, which is largely used for fertilizer, because they did not manufacture the material and sold it simply as a chemical substance, "and in no state in the Union do we pay a license fee for selling them."

A letter addressed to the person in charge of the chemical department of the Ohio experiment station elicited the reply, "but should it be offered to the farmers as a 'fertilizer' it would have to be registered as such and analyzed, and the packages marked with analysis. The fact of its importation would be of no consequence; we consider merely whether it is on the market as a fertilizer and sold to farmers." In many of the eastern states it is considered as requiring the same treatment for license as other fertilizers. Under these conditions the chloride and sulphate of potassium, nitrate of sodium, and similar commercial salts used for fertilizers will require a license fee in this state.

It may seem a hardship to the dealer to require a license from each one for every brand of fertilizer he offers for sale. Yet it is obvious that the system of inspecting and licensing is necessary to protect the farmers from heavy loss. If a license is required of one, it must be required of all.

#### OBJECT OF INSPECTION OF COMMERCIAL FERTILIZERS.

The law does not prescribe any standard for the composition of a commercial fertilizer, the manufacturer being free to make his own standard, the law simply requiring that the fertilizers offered for sale shall be up to the standard set up by the manufacturer. The license to sell does not certify to the value of the fertilizer, but simply states that the manufacturer or dealer offers for sale a fertilizer for which a certain content of nitrogen, potash, and phosphoric acid is claimed, and that samples of such fertilizers have been deposited with the secretary of the college with affidavit regarding the composition. Analysis is then made of each of these fertilizers, gathered in the open market as far as possible, and the results of such analysis published in bulletin. The *claimed* composition and *found* composition are arranged in parallel lines, so that the real com-

position can be compared at a glance with the composition claimed for it by manufacturer. In this way the buyer can see at once by this bulletin whether the fertilizer is as good as the claims made for it.

#### WHAT TO LEARN FROM THE ANALYSIS.

The three most valuable materials in commercial manures are potash, phosphoric acid, and available nitrogen. Each of these has a commercial value, and the worth of any given quantity in the market may be stated in dollars and cents. Only these three substances are considered in the inspection of commercial fertilizers, because the other materials are of too little value to be purchased at high prices. The essential value of these fertilizers lies in the potash, phosphoric acid, and available nitrogen they contain. The law does not prescribe the amount of these substances in any fertilizer, but requires the manufacturer or dealer to certify the composition of the fertilizer, and to deposit a sample of the fertilizer with the secretary of the State Board of Agriculture. In this way the composition of the fertilizer as claimed by the manufacturer is offered to the public. Samples of the fertilizer are gathered in the open market, and analyzed, and the results directly compared with the claims of the manufacturer in the bulletin. The farmer can thus find in the bulletin, on lines opposite each fertilizer, the amount of nitrogen, phosphoric acid, and potash as claimed by the manufacturer, and as actually found by analysis at this laboratory. If the analysis shows more of any given substance than is claimed, the goods are better than claimed; but if much less is found on analysis than is claimed, then the goods are proportionately of less value to the farmer. For example, an Ohio potato fertilizer was sold in the state last year that fell short of the claimed amount of available nitrogen by more than two per cent, and of potash by more than three per cent., and the fertilizer was not worth so much as claimed by \$11 per ton. By consulting the tables in the bulletin, the market value of these commercial fertilizers can be estimated on the basis that available phosphoric acid is worth eight cents per pound, insoluble phosphoric acid three cents, potash six cents, and ammonia eighteen cents. As there are 20 times 100 pounds in a ton, if we multiply the value of a pound by 20, we get the value of one per cent. of each substance, and thus obtain a factor for obtaining the value of the material in a ton from the percentage given in the tables of the bulletin. One per cent. means 20 pounds in a ton, and if the material is worth eight cents per pound then each per cent. equals \$1.60 per ton.

Multiply \$1.60 by the per cent. of available phosphoric acid.

"	.60	"	"	insoluble	"	"
"	3.60	"	"	ammonia.		
"	1.20	"	"	potash.		

The sum will give the market value of a ton of such fertilizer. Take for example Vegetable Bone fertilizer as found last year:

Ammonia 5.76 %	× \$3.60=	-----	\$20.74
Available phosphoric acid 5.40 %	× 1.60=	-----	8.64
Insoluble " " 1.48 %	× .60=	-----	.89
Potash 7.80 %	× 1.20=	-----	9.36
Market value per ton			<hr/> \$39.62

The law respecting inspection and licensing commercial fertilizers is again inserted, because so many seem to be ignorant of its provisions:

[Session Laws of 1885, No. 26.]

AN ACT to provide for the inspection of commercial fertilizers and to regulate the sale thereof.

SECTION 1. *The People of the State of Michigan enact*, That any person or persons who shall sell or offer for sale in this state any commercial fertilizer, the retail price of which exceeds ten dollars per ton, shall affix on the outside of every package containing such fertilizer a plainly printed certificate, stating the number of net pounds therein; the name or trade mark under which such article is sold; the name of the manufacturer; the place of manufacture, and a chemical analysis, stating the percentage of nitrogen in an available form; of potash soluble in water, and of phosphoric acid in available form (soluble or reverted) and the insoluble phosphoric acid.

SEC. 2. Before any commercial fertilizer is sold or offered for sale, the manufacturer, importer, or party who causes it to be sold or offered for sale within this state, shall file with the secretary of the State Board of Agriculture a certified copy of the analysis and certificate referred to in section one, and shall also deposit with said secretary a sealed glass jar containing not less than two pounds of such fertilizer, with an affidavit that it is a fair sample of the article thus to be sold or offered for sale.

SEC. 3. The manufacturer, importer, or agent of any commercial fertilizer, the retail price of which exceeds ten dollars per ton as aforesaid, shall pay annually to the secretary of the State Board of Agriculture, on or before the first day of May, a license fee of twenty dollars for each and every brand of fertilizer he offers for sale in this state: *Provided*, That whenever the manufacturer or importer shall have paid this license fee his agents shall not be required to do so.

SEC. 4. All such analyses of commercial fertilizers required by this act shall be made under the direction of the State Board of Agriculture and paid for out of the funds arising from the license fees provided for in section three. At least one analysis of each fertilizer shall be made annually.

SEC. 5. The secretary of the State Board of Agriculture shall publish in his annual report a correct statement of all analyses made and certificates filed in his office, together with a statement of all moneys received for license fees, and expended for analysis. Any surplus from license fees remaining on hand at the close of the fiscal year shall be placed to the credit of the experimental fund of said board.

SEC. 6. Any person or persons who shall sell or offer for sale any commercial fertilizer in this state without first complying with the provisions of sections one, two, and three of this act, or who shall attach or cause to be attached to any such package or fertilizer an analysis stating that it contains a larger percentage of any one or more of the constituents or ingredients named in section one of this act than it really does contain shall, upon conviction thereof, be fined not less than one hundred dollars for the first offense, and not less than three hundred dollars for every subsequent offense, and the offender shall also be liable for damages sustained by the purchaser of such fertilizer on account of such misrepresentation.

SEC. 7. The State Board of Agriculture by any duly authorized agent is hereby authorized to select from any package of commercial fertilizer exposed for sale in this state, a quantity, not exceeding two pounds, for a sample, such sample to be used for the purposes of an official analysis and for comparison with the certificate filed with the secretary of the State Board of Agriculture and with the certificate affixed to the package on sale.

SEC. 8. All suits for the recovery of fines under the provisions of this act shall be brought under the direction of the State Board of Agriculture.

Approved March 10, 1885.

For the information of the parties concerned, the fertilizers that have been licensed for 1893 are contained in the list of this bulletin; also those that have not been licensed and whose sale is illegal in this state will be marked with a star.

The primary object of this law is to give information in regard to the composition of commercial fertilizers, and to protect farmers from imposition and loss. The question of their agricultural value, and relation to

crops and different kinds of soils is not touched. These subjects require a separate examination for determining the relative value of any given fertilizer with reference to different soils and crops. The farmer can settle for himself such questions by trials of the fertilizer on a small portion of a field by comparing the results with other parts of the same field and crop on which no fertilizer has been applied. The conditions of crop, soil, and climate are thus brought home to him more completely than any investigation in other places and conditions can furnish.

How the state may place before the farmers the agricultural value of the various fertilizers offered for sale is a very different subject from that contemplated by this law for the inspection of such fertilizers. The law of inspection offers no advice whether the farmer shall buy such fertilizers, or depend upon the home supply. In case he determines to buy, it affords him some basis for calculating the commercial value of the different brands offered for sale, and to select honest goods which are found to be the same in the market as are claimed by the seller. He may also be on his guard not to buy the goods which are not licensed for sale as not worthy of confidence.

With this brief statement of the objects sought by inspection, and the results of analysis of goods selected in the open market as compared with the claims of the manufacturer, this bulletin is submitted to the public.

R. C. KEDZIE,

*Chemist of Experiment Station.*

AGRICULTURAL COLLEGE, }  
July 12, 1893. }

*Analysis of Commercial Fertilizers*

Manufacturer.	Trade Name.	Dealer and Locality.
Crocker Chemical Works, Buffalo, { N. Y. ....	Practical Ammoniated Super- phosphate. ....	Dan Williams, Morenci, Mich.
Crocker Chemical Works, Buffalo, { N. Y. ....	New Rival Ammoniated Super- phosphate. ....	C. C. Van Doren, Adrian .....
Crocker Chemical Works, Buffalo, { N. Y. ....	Vegetable Bone Superphosphate	C. C. Van Doren, Adrian .....
Crocker Chemical Works, Buffalo, { N. Y. ....	Potato, Hop and Tobacco } Superphosphate. ....	C. C. Van Doren, Adrian .....
Crocker Chemical Works, Buffalo, { N. Y. ....	Ammoniated Bone Super- phosphate. ....	C. A. Slayton, Tecumseh .....
Crocker Chemical Works, Buffalo, { N. Y. ....	Pure Ground Bone .....	C. A. Slayton, Tecumseh .....
Crocker Chemical Works, Buffalo, { N. Y. ....	Ammoniated Wheat and Corn } Superphosphate. ....	.....
Crocker Chemical Works, Buffalo, { N. Y. ....	Buffalo Superphosphate No. 2 .....	Dan Williams, Morenci .....
Crocker Chemical Works, Buffalo, { N. Y. ....	Special Potato Fertilizer .....	J. Carpenter, Blissfield .....
Crocker Chemical Works, Buffalo, { N. Y. ....	Niagara Phosphate .....	Manufacturer .....
Crocker Chemical Works, Buffalo, { N. Y. ....	Crocker's Lawn Fertilizer .....	Manufacturer .....
Crocker Chemical Works, Buffalo, { N. Y. ....	Ground Bone Meal .....	Manufacturer .....
Cleveland Dryer Co., Cleveland, O. ....	Buckeye Bone Superphosphate .....	E. W. Spencer, Petersburg ...
Cleveland Dryer Co., Cleveland, O. ....	Ohio Seed Maker .....	Fred Weisenger, Deerfield .....

\* Not licensed: Sale unlawful if the retail price exceeds \$10 a ton. Penalty for selling or offering for sale a fine of \$100. See Sec. 6 of the law.

The fertilizers that are not starred have been licensed for 1893 and their sale is legal.

*in Michigan for 1893.*

	Available Nitrogen.	Phosphoric Acid.			Potash Soluble in H <sub>2</sub> O.	
	Estimated as N H <sub>3</sub> .	Available P <sub>2</sub> O <sub>5</sub> .	Insoluble P <sub>2</sub> O <sub>5</sub> .	Total P <sub>2</sub> O <sub>5</sub> .	Estimated as K <sub>2</sub> O.	Estimated as K <sub>2</sub> SO <sub>4</sub> .
{ Claimed ..... { Found.....	1 to 2 1.10	8 to 10 9.91	1 to 2 1.27	9 to 12 11.18	1 to 2 1.62	2 to 3 2.99
{ Claimed ..... { Found.....	1.50 to 2.50 1.60	10 to 12 10.05	1 to 3 3.09	11 to 15 13.14	1.60 to 3 1.74	3 to 5 3.11
{ Claimed ..... { Found.....	6 to 7 6.27	6 to 7 4.22	1 to 2 2.51	7 to 9 7.03	6 to 8 10.41	11 to 15 19.25
{ Claimed ..... { Found.....	2.50 to 3.50 2.46	10 to 12 10.92	1 to 2 .64	11 to 14 11.56	3.25 to 4.80 3.36	6 to 8 6.21
{ Claimed ..... { Found.....	3.50 to 4.50 5.71	10 to 12 5.73	1 to 2 1.43	11 to 14 7.16	1 to 2 7.92	2 to 3 14.65
{ Claimed ..... { Found.....	3.50 to 4.50 5.45			25 23.02		
{ Claimed ..... { Found.....	2.50 to 3.50 2.80	10 to 13 10.21	1 to 2 3.73	11 to 15 13.94	1.60 to 2.70 1.79	3 to 5 3.31
{ Claimed ..... { Found.....		11 to 13 9.07	1 to 2 2.11	12 to 15 11.18	1.35 to 2.00 1.59	2.50 to 3.50 2.91
{ Claimed ..... { Found.....	4.50 to 5.50 4.25	8 to 9 7.10	1 to 2 1.82	9 to 11 8.92	5.40 to 6.40 5.88	10 to 12 10.87
{ Claimed ..... { Found.....		11.50 to 13 11.45	1 to 2 3.51	12.50 to 15 14.96		
{ Claimed ..... { Found.....	5 to 6 5.50			18 to 20 21.34	2.13	6 to 8 3.94
{ Claimed ..... { Found.....	2.50 to 4.00 5.20			25 24.94		
{ Claimed ..... { Found.....	3 to 4 3.82	9 to 10 12.01	2.64	11 to 12 14.65	1 to 2 1.12	2.07
{ Claimed ..... { Found.....	1.50 to 2.50 1.97	10 to 12 9.21	2.81	15 to 17 12.02		

*Analysis of Commercial Fertilizers*

Manufacturer.	Trade Name.	Dealer and Locality.
Cleveland Dryer Co., Cleveland, O....	Special Potato Fertilizer.....	Martin & Blood, Hudson .....
Cleveland Dryer Co., Cleveland, O....	Square Bone.....	E. W. Spencer, Petersburg ..
Cleveland Dryer Co., Cleveland, O....	Ammoniated Dissolved Bone...	E. W. Spencer, Petersburg ..
Cleveland Dryer Co., Cleveland, O....	* Nitrate of Soda .....	G. B. Pomeroy, South Haven..
Cleveland Dryer Co., Cleveland, O....	* Chloride of Potassium.....	G. B. Pomeroy, South Haven ..
Michigan Carbon Works, Detroit, } Mich. ....	Jarves Celery Grower.....	Geo. Hancock, Grand Haven ..
Michigan Carbon Works, Detroit, } Mich. ....	Jarves Drill Phosphate .....	C. B. Waterloo, Port Huron...
Michigan Carbon Works, Detroit, } Mich. ....	Homestead Potato Grower ....	Gill R. Lovejoy, Lenox .....
Michigan Carbon Works, Detroit, } Mich. ....	Homestead Superphosphate ....	P. Coddington, Morenci .....
Michigan Carbon Works, Detroit, } Mich. ....	Banner Dissolved Bone.....	Geo. Hancock, Grand Haven ..
Northwestern Fertilizer Co., Chica- } go, Ill. ....	Horseshoe Brand Prairie Phos- } phate .....	C. B. Waterloo, Port Huron...
Northwestern Fertilizer Co., Chica- } go, Ill. ....	Horseshoe Brand Corn Grower ..	Jas. Stevenson & Son, Adrian..
Northwestern Fertilizer Co., Chica- } go, Ill. ....	Horseshoe Brand Garden City } Superphosphate.....	C. B. Waterloo, Port Huron...
Northwestern Fertilizer Co., Chica- } go, Ill. ....	Celery Grower .....	J. F. Farnum, Kalamazoo ....
Northwestern Fertilizer Co., Chica- } go, Ill. ....	Horseshoe Brand Fine Raw } Bone .....	C. A. Slayton, Tecumseh.....

\* Not licensed: Sale unlawful if the retail price exceeds \$10 a ton. Penalty for selling or offering for sale a fine of \$100. See Sec. 6 of the law.

*in Michigan for 1893.—Continued.*

	Available Nitrogen.	Phosphoric Acid.			Potash Soluble in H <sub>2</sub> O.	
	Estimated as N H <sub>3</sub> .	Available P <sub>2</sub> O <sub>5</sub> .	Insoluble P <sub>2</sub> O <sub>5</sub> .	Total P <sub>2</sub> O <sub>5</sub> .	Estimated as K <sub>2</sub> O.	Estimated as K <sub>2</sub> SO <sub>4</sub> .
{ Claimed..... { Found.....	4 to 5 4.01	8 to 10 7.71	..... .40	10 to 14 8.11	4 to 6 6.51	..... 12.04
{ Claimed..... { Found.....	3 to 4 3.54	6 to 10 13.87	..... 8.65	20 to 25 22.53	.....	.....
{ Claimed..... { Found.....	1.50 to 2.50 2.09	10 to 12 10.17	..... 3.95	15 to 18 14.12	.....	.....
{ Claimed..... { Found.....	..... 18.31	.....	.....	.....	.....	.....
{ Claimed..... { Found.....	.....	.....	.....	.....	80.4	.....
{ Claimed..... { Found.....	1 1.90	..... 10.66	..... 1.08	1 11.74	1 3.27	..... 6.04
{ Claimed..... { Found.....	1.25 to 2 1.46	8.50 to 9.50 7.53	2 to 3 2.14	10.50 to 12.50 9.67	.....	.....
{ Claimed..... { Found.....	3 to 4 3.58	9.50 to 11 9.19	.50 to 1.50 2.22	10 to 12.50 11.41	..... 3.62	6.50 to 7.50 6.79
{ Claimed..... { Found.....	1.85 to 2.40 2.93	7.50 to 11 8.39	..... 1.20	..... 9.59	..... 1.75	2.75 to 3.50 3.28
{ Claimed..... { Found.....	.....	34 to 38 24.17	..... 6.65	36 to 40 30.82	.....	.....
{ Claimed..... { Found.....	2 to 2.50 1.90	..... 7.73	..... 3.01	9 to 11 10.74	.....	.....
{ Claimed..... { Found.....	2.50 to 3.00 3.13	8 to 9 10.30	..... 3.77	..... 14.07	.54 to 1.08 1.11	..... 2.65
{ Claimed..... { Found.....	2.50 to 3.00 2.73	8 to 9 10.10	4 to 4.50 2.56	12 to 13.50 12.66	.54 to 1.08 .81	..... 1.49
{ Claimed..... { Found.....	3 to 4 3.02	7 to 9 8.89	..... 6.74	7 to 9 15.63	..... .74	2 to 3 1.36
{ Claimed..... { Found.....	3 to 4 2.08	.....	.....	22 to 24 22.64	.....	.....

*Analysis of Commercial Fertilizers*

Manufacturer.	Trade Name.	Dealer and Locality.
W. S. Dunbar, St. Joseph, Mich. ....	Meat and Bone.....	Manufacturer.....
W. S. Dunbar, St. Joseph, Mich. ....	Fish Guano .....	Manufacturer .....
Bradley Fertilizer Co., Boston, Mass..	* Bradley's Dissolved Bone with } Potash .....	C. Kraling, Kalamazoo .....
Bradley Fertilizer Co., Boston, Mass..	* Sea Fowl Guano .....	C. Kraling, Kalamazoo .....
Pottstown Iron Co., Pottstown, Pa...	Odorless Phosphate.....	C. A. Slayton, Tecumseh.....
Lister's Agricultural Chemical } Works, Newark, N. J.....	Lister's Success.....	John McCullough, Ypsilanti..
Joseph Lister, Chicago, Ill.....	Pure Bone Meal.....	C. B. Waterloo, Port Huron...
H. J. Baker & Bros., New York, N. Y..	Complete Lawn Dressing Ma- } nure .....	Alfred Brown, Grand Rapids..
H. J. Baker & Bros., New York, N. Y..	Grade "A" for Potatoes, Spec- } ial Truck Manure.....	Alfred Brown, Grand Rapids..
Grand Rapids Glue Co., Grand Rap- } ids, Mich.....	Non Plus Ultra.....	Manufacturer .....
Michigan Phosphate Co., Saginaw, } Mich.....	Pure Ground Bone.....	Manufacturer .....
Michigan Phosphate Co., Saginaw, } Mich.....	Rich Harvest.....	Manufacturer .....
Michigan Phosphate Co., Saginaw, } Mich.....	Bone and Meat.....	Manufacturer .....
Cincinnati Dessicating Co., Cincin- } nati, O.....	* Phoenix Phosphate .....	A. J. Hasbrouck & Co., Hudson
Cincinnati Dessicating Co., Cincin- } nati, O.....	* Gilead Phosphate.....	A. J. Hasbrouck & Co., Hudson

\* Not licensed: Sale unlawful if the retail price exceeds \$10 a ton. Penalty for selling or offering for sale a fine of \$100. See Sec. 6 of the law.

*in Michigan for 1893.—Continued.*

	Available Nitrogen.	Phosphoric Acid.			Potash Soluble in H <sub>2</sub> O.	
	Estimated as N H <sub>3</sub> .	Available P <sub>2</sub> O <sub>5</sub> .	Insoluble P <sub>2</sub> O <sub>5</sub> .	Total. P <sub>2</sub> O <sub>5</sub> .	Estimated as K <sub>2</sub> O.	Estimated as K <sub>2</sub> SO <sub>4</sub> .
{ Claimed Found.....	5.79	4.68	6.24	10.92	.65	1.20
{ Claimed Found.....	8.05	2.44	2.04	4.48	.97	1.75
{ Claimed Found.....	1 to 2 1.20	6 to 8 6.59	2.75	10 to 12 9.34	4 to 6 2.12	3.92
{ Claimed Found.....	2.07	9.20	3.03	12.23	2.00	3.70
{ Claimed Found.....		4.92 7.79	12.17	20.87 19.96		
{ Claimed Found.....	1.25 to 2 1.82	9.22	1.85	10.50 to 12.00 11.07	1.50 to 2 2.11	3.85
{ Claimed Found.....	3.05 3.74			24.65 26.27		
{ Claimed Found.....	4.50 to 5 2.60	5 to 6 4.91	1.08	5.99	7.50 to 9 12.73	23.55
{ Claimed Found.....	3 to 6 5.26	5 to 8 4.15	2.81	6.96	7 to 10 13.81	25.54
{ Claimed Found.....	3.82	.96	6.38	7.34	.58	1.08
{ Claimed Found.....	4.50 to 5.50 3.07			21 to 24 26.25		
{ Claimed Found.....	2 to 3 3.31	6.14	5.63	9 to 11 11.77	1 to 2 1.41	2.60
{ Claimed Found.....	3.50 to 5 3.92	9.27	6.26	10 to 13 15.53	2 to 3 1.80	3.33
{ Claimed Found.....	2.66	7.78	3.37	11.15	1.02	1.88
{ Claimed Found.....	3.36	9.65	4.09	13.74	2.08	3.84

*Analysis of Commercial Fertilizers*

Manufacturer.	Trade Name.	Dealer and Locality.
Swift & Co., Chicago, Ill.....	Swift's Steamed Bone.....	H. Roossiew, Grand Haven ....
Swift & Co., Chicago, Ill.....	Swift's Pure Raw Bone Meal....	G. W. Miller, Grand Haven.....
Swift & Co., Chicago, Ill.....	* Swift's Dried Blood.....	Martin Keift, Grand Haven ....
Swift & Co., Chicago, Ill.....	* Swift's Tankage.....	Martin Keift, Grand Haven ....
Oakfield Fertilizer Co., Buffalo, N. Y.	Potato and Tobacco Phosphate.	C. C. Corwin, Grass Lake.....
Oakfield Fertilizer Co., Buffalo, N. Y.	Great Value .....	Peter Grinnell, Richmond.....
Oakfield Fertilizer Co., Buffalo, N. Y.	Domestic Fertilizer.....	C. C. Corwin, Grass Lake.....
Jarecki Chemical Co., Sandusky, O...	Lake Erie Fish Guano.....	Wm. Rothfuss, Blissfield .....
Jarecki Chemical Co., Sandusky, O...	C. O. D. Phosphate.....	Manufacturer.....
Jarecki Chemical Co., Sandusky, O...	Ground Bone.....	Manufacturer.....
Ypsilanti Plant Food Co., Ypsilanti, } Mich..... }	* Odorless Lawn Dressing .....	Miss Rogers, Ann Arbor.....
American Cutlery Co., Chicago, Ill....	* Fine Bone Meal .....	Alfred Brown, Grand Rapids...
James Boland, Jackson, Mich.....	Blackman Fertilizer.....	Manufacturer.....

\* Not licensed : Sale unlawful if the retail price exceeds \$10 a ton. Penalty for selling or offering for sale, a fine of \$100. See Sec. 6 of the law.

*in Michigan for 1893.—Concluded.*

	Available Nitrogen.	Phosphoric Acid.			Potash Soluble in H <sub>2</sub> O.	
	Estimated as N H <sup>3</sup> .	Available P <sub>2</sub> O <sub>5</sub> .	Insoluble P <sub>2</sub> O <sub>5</sub> .	Total P <sub>2</sub> O <sub>5</sub> .	Estimated as K <sub>2</sub> O.	Estimated as K <sub>2</sub> SO <sub>4</sub> .
{ Claimed ..... { Found .....	3.50 to 4.50 3.82	.....	.....	25 to 30 25.35	.....	.....
{ Claimed ..... { Found .....	4.50 to 5.50 4.94	.....	.....	25 to 27 24.69	.....	.....
{ Claimed ..... { Found .....	..... 16.69	.....	.....	..... .44	..... .21	..... .38
{ Claimed ..... { Found .....	..... 9.26	.....	.....	..... 8.60	.....	.....
{ Claimed ..... { Found .....	3 to 4 1.85	6 to 8 8.05	1 to 2 .83	7 to 10 8.88	..... 4.91	8 to 10 9.08
{ Claimed ..... { Found .....	1 to 2 1.20	6 to 8 6.72	1 to 2 1.03	7 to 10 7.75	..... 1.42	2 to 3 2.62
{ Claimed ..... { Found .....	2 to 3 1.64	8 to 10 8.27	1 to 2 1.02	9 to 12 9.29	..... 1.95	2 to 3 3.60
{ Claimed ..... { Found .....	2.50 to 3 2.22	10 to 12 10.57	..... 3.78	12 to 14 14.35	1 to 2 .56	..... 1.03
{ Claimed ..... { Found .....	.....	11.43	4.99	16.42	.....	.....
{ Claimed ..... { Found .....	..... 5.51	.....	.....	21.15	.....	.....
{ Claimed ..... { Found .....	.....	.....	.....	19.96	.....	.....
{ Claimed ..... { Found .....	..... 4.77	.....	.....	25.48	.....	.....
{ Claimed ..... { Found .....	..... 1.05	..... 5.35	..... 1.31	..... 6.69	..... .27	..... .49

## THE SOILS OF MICHIGAN.

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Bulletin No. 99.—Chemical Department.

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No state in the Union has suffered more in reputation from false statements and ignorant misrepresentation than Michigan. At the time of its first settlement, to the popular apprehension the far-off and unknown Michigan was only, and would forever remain, the home of the wolf, the Indian, and ague. By the white man it was uninhabited and uninhabitable. In a report made to a religious body in regard to the feasibility of establishing missionary stations in order to christianize this heathen wild, it was stated that the project was impracticable, "because only a narrow strip along the border of the territory was inhabitable, the interior being a vast and impenetrable swamp."

In his address at the laying of the corner stone of the new capitol in 1872, Hon. W. A. Howard made the following extract from the report of the surveyor-general of Ohio, bearing date November 30, 1815: "The country on the Indian boundary line, from the mouth of the great Auglaize river and running thence for about fifty miles is (with few exceptions) low, wet land, with a very thick growth of underbrush, intermixed with very bad marshes, but generally very heavily timbered with beech, cottonwood, oak, etc.; thence continuing north and extending from the Indian boundary eastward, the number and extent of the swamps increase, with the addition of numbers of lakes from twenty chains to two or three miles across. Many of the lakes have extensive marshes adjoining their margins, sometimes thickly covered with a species of pine called tamarack, and other places covered with a coarse, high grass and uniformly covered from six inches to three feet (and more at times) with water. The margins of these lakes are not the only places where swamps are found, for they are interspersed throughout the whole country, and filled with water, as above stated, and varying in extent. The intermediate space between the swamps and lakes, which is probably near one half of the country, is with a very few exceptions a poor, barren, sandy land, on which scarcely any vegetation grows, except very small scrubby oaks. In many places that part which may be called dry land is composed of little short sand hills, forming a kind of deep basin, the bottoms of many of which are composed of marsh, similar to the above described. The streams are generally narrow and very deep, compared with their width, the shores and bottoms of which are (with a very few exceptions) swampy beyond description; and it is with the utmost difficulty that a place can be found over which horses can be conveyed.

"A circumstance peculiar to that country is exhibited in many of the

marshes by their being thinly covered with a sward of grass, by walking on which evinced the existence of water or a very thin mud immediately under their covering, which sinks from six to eighteen inches from the pressure of the foot at every step and at the same time rising before and behind the person passing over. The margins of many of the lakes and streams are in a similar situation and in many places literally afloat. On approaching the eastern part of the military lands toward the private claims on the straits and lake, the country does not contain so many swamps and lakes, but the extreme sterility and barrenness of the soil continues the same. Taking the country altogether, so far as has been explored and to all appearances, together with the information received concerning the balance, it is so bad there would not be more than one acre out of one hundred, if there would be one out of one thousand that would, in any case, admit of cultivation."

From the number of persons who have continued to decry Michigan in whole or in part it would seem that the surveyor general of Ohio had a large family. But as settlers poured into the new territory they were surprised and delighted to find, instead of impassable bogs and sterile sand-hills, a region of wonderful beauty and fertility. Thus one county after another was rescued from the supposed dominion of chimeras dire, and pronounced to be the best farm lands on which the sun shines. But who shall say how many persons have been deterred by such ignorant and reckless assertions from making their home in the best state in our Union? Sin drove the first pair from the primal Eden, but ignorance has barred out thousands of their children from many an earthly paradise.

#### GEOGRAPHICAL POSITION.

When we cast our eyes upon the map of our country we are struck with the unique position which our peninsula occupies in comparison with other lands in the same latitude and mark how Nature clasps with her protecting arms of *water* the "beautiful peninsula" and pours out the vast "unsalted seas" a rampart against the cold. Its geographical position and surroundings point it out as eminently fitted for productive industry, while its easily available water carriage will save it from the blighting influence of monopoly in transportation. The watered stock of railways finds more than a match in the water ways of our system of lakes, drowning out monopoly of transportation. Michigan is planted on the highway of nations—the highway of commerce that must last "so long as grass grows and water runs." Such a region must occupy a prominent position in the world's industries and commerce, unless these exceptional advantages are offset by unusual disabilities.

#### LUMBERING VS. FARMING.

The vast wealth of Michigan in lumber has so filled the public eye that it could not see the greater wealth of its soil. Men seemed to assume that the better it was for lumber the worse it must be for agriculture—as if a soil that could sustain such a wonderful forest growth must be incapable of growing anything but wood. As a consequence, men seeking for new lands to make new homes have turned their back on rich soils, well watered lands, ready markets, available transportation, schools and churches,

security and civilization to seek in the far west their resting place amid the alternate parching heat and deadly cold, and the wild disorder, discomfort, and insecurity of border life. They reached for sunset and grasped a shadow. The great mass of these restless wanderers have rejected Michigan for a home because they were ignorant of this region—of its soil, productions, capabilities for cultivation, and its adaptedness to make desirable homes.

#### ANALYSIS OF MICHIGAN SOILS.

Desirous of obtaining reliable data for estimating the value of our soils, I sent out a circular fifteen years ago asking for representative soils from all the counties of the state, for chemical analysis, calling for soils that would be fairly representative of the locality, and not soils of exceptional quality. In response to this circular, thirty-one samples of soil were received, analyzed, and the results of analysis published in the report of the State Board of Agriculture for 1878. Some attention was also directed to the physical properties of the soil, especially as related to water.

When chemistry was first applied to agriculture, it was supposed that the greatest benefit which chemistry could confer upon agriculture was to be derived from the analysis of the soil. The striking results which Sir Humphrey Davy obtained by analysis of a soil, barren from excess of the sulphate of iron, and the removal of the barrenness by adding lime to decompose the sulphate, confirmed the impression of the signal benefit to be derived from a chemical analysis of the soil. It was supposed that the fertility of any soil, the kind of crop it was fitted to raise, or the material which must be added to the soil to develop its greatest productiveness, were each and all to be determined simply by a chemical analysis of the soil. These extravagant expectations have not been realized. It was found that chemical analysis will not always distinguish between a fruitful and an unfruitful soil. A soil may be unproductive for physical reasons, though it may still contain all the chemical elements of fertility. The complete failure of Liebig's mineral theory of manures when put to the test of experience rang the knell of mere soil analysis.

But if chemical analysis failed when so much was demanded of it, we are not to go to the other extreme and conclude that because it is not good for so many things it is good for nothing. Chemical analysis of the soil is of value in determining whether a soil is capable of fertility or the contrary; also in determining the measure of its possible fertility. There are certain ash elements which are absolutely necessary for plant growth, in the absence of any one of which vegetable growth is impossible; if the supply is relatively limited, plant growth will be limited correspondingly. If all the ash elements are present in sufficient amount and in available form, such soil is capable of fertility. Hence, chemical analysis of a soil is of importance in determining possibility of fertility and of the relative fertility which may be secured under favorable conditions.

#### CLASSIFICATION OF MICHIGAN SOILS.

No minute and technical classification of soils is attempted. The soils are classed rather for their agricultural uses than their chemical composition, the geographical position and climatic conditions in some cases affording a basis for classifying, e. g., the peach lands.

A word of explanation in regard to the meaning of the tables of analysis may be proper. To any one not familiar with agricultural chemistry, such tables will appear very dry and uninteresting, or even unintelligible. In these tables sand and silicates, alumina, and oxide of iron make much the largest part of most soils. Everyone is familiar with sand; alumina is the basis of clay, and oxide of iron gives the brownish color to most soils. The great bulk of nearly all soils is made up of sand, clay, and oxide of iron. Alumina is never found in the ash of cultivated plants; a certain amount of silica and oxide of iron is found in the ash of all plants; but the great mass of these materials as found in the soil is in large excess of the demands of the plant, and is of no worth in the chemistry of plant life; they are the mechanical agents of the soil, and are of worth mainly from their relations to temperature, moisture, and the mechanical support of plants; their chief office in the soil is physical and not chemical, rendering the soil light or heavy, porous or retentive. The organic matter of the soil, besides furnishing a supply of combined nitrogen, is valuable for its physical relations to temperature, moisture, and porosity of soils, and because it is an active agent in securing chemical changes in the soil, bringing the reserve elements of plant growth into active form.

The numbers attached to the following analyses refer to sample bottles of soils placed in the exhibit of the experiment station of the Michigan Agricultural college in the World's Fair, and to corresponding sample bottles in the Michigan state exhibit in Agricultural hall and one other set of such bottles at the Michigan Agricultural college. By referring to these sample bottles the reader can find the soils as well as learn their chemical composition.

### 1. *Wheat Lands. Nos. 1 to 9.*

A large part of the soils of Michigan are well fitted for the growth of winter wheat, and it might seem invidious to select any portion as wheat lands in particular, but the four southern tiers of counties are so specially adapted to this crop that they may be called the wheat belt.

#### No. 1.—*River Raisin Bottoms, Deerfield, Lenawee, County.*

Selected by Geo. H. Kedzie.	
Forest Growth: Ash, Basswood. Hickory, Black Walnut, Oak, etc.	
Soil cultivated forty years, without manure.	
Sand and silicates.....	58.17
Alumina.....	6.48
Oxide of iron.....	7.62
Lime.....	1.98
Magnesia.....	1.43
Potash.....	1.84
Soda.....	1.20
Sulphuric acid.....	.32
Phosphoric acid.....	.40
Organic matter containing.....	.42
Nitrogen.....	10.97
Water.....	9.45

Capillary capacity for water, 65.60

#### No. 2.—*River Raisin Bottoms, Deerfield, Lenawee Co.*

Selected by Geo H. Kedzie.	
Virgin soil.	
Timber: Ash. Basswood. Black Walnut, Oak, etc.	
Sand and silicates.....	62.42
Alumina.....	10.64
Oxide of iron.....	3.46
Lime.....	2.10
Magnesia.....	1.59
Potash.....	2.05
Soda.....	1.19
Sulphuric acid.....	.24
Phosphoric acid.....	.41
Organic matter containing.....	.37
Nitrogen.....	9.39
Water.....	6.08

Capillary capacity for water, 61.20

No. 3.—*Burr Oak Wheat Lands, Saline, Washtenaw county.*

Selected by J. S. Wood.

Timber: Burr Oak.

Sand and silicates.....	81.00
Alumina.....	5.23
Oxide of iron.....	4.66
Lime.....	1.28
Magnesia.....	.86
Potash.....	1.18
Soda.....	.19
Sulphuric acid.....	.42
Phosphoric acid.....	.40
Organic matter containing .11 nitro- gen.....	2.98
Water.....	1.72

Capillary capacity for water, 36.30.

No. 4.—*Prairie Soil, Volinia, Cass Co.*

Selected by M. J. Gard.

Soil has been pastured but never cultivated.

Sand and silicates.....	63.77
Alumina.....	3.72
Oxide of iron.....	5.11
Lime.....	2.02
Magnesia.....	.66
Potash.....	1.18
Soda.....	.56
Sulphuric acid.....	.13
Phosphoric acid.....	.44
Organic matter containing .23 nitro- gen.....	12.30
Water.....	10.19

Capillary capacity for water, 73.20.

No. 5.—*Prairie Soil, Volinia, Cass Co.*

Selected by M. J. Gard.

Soil has been cultivated for thirty years, has been plastered.

Sand and silicates.....	75.74
Alumina.....	4.20
Oxide of iron.....	5.46
Lime.....	1.38
Magnesia.....	.56
Potash.....	1.10
Soda.....	.43
Sulphuric acid.....	.18
Phosphoric acid.....	.33
Organic matter containing .21 nitro- gen.....	7.50
Water.....	3.10

Capillary capacity for water, 50.55.

No. 6.—*Bottom lands of Tittabawassee.*

Selected by Geo. F. Ball.

Timber: Beech, maple, oak and basswood.

Sand and silicates.....	67.20
Alumina.....	6.31
Oxide of iron.....	7.91
Lime.....	1.64
Magnesia.....	1.23
Potash.....	1.85
Soda.....	1.15
Sulphuric acid.....	.30
Phosphoric acid.....	.49
Organic matter containing .22 nitro- gen.....	7.48
Water.....	4.00

Capillary capacity for water, 51.40.

No. 7.—*Garden Soil, Agricultural College.*

Shlected by R. C. Kedzie.

Timber: Oak, beech, maple, elm, cherry and sassafras.

Sand and silicates.....	85.37
Alumina.....	4.53
Oxide of iron.....	1.81
Lime.....	1.22
Magnesia.....	.59
Potash.....	.85
Soda.....	.37
Sulphuric acid.....	.23
Phosphoric acid.....	.30
Organic matter containing .16 nitro- gen.....	3.14
Water.....	1.55

Capillary capacity for water, 39.60.

No. 8.—*Clay Soil from Vineyard Agricultural College.*

Selected by R. C. Kedzie.

Timber: Oak, maple, beech and elm.

Sand and silicates.....	65.48
Alumina.....	15.60
Oxide of iron.....	6.40
Lime.....	1.28
Magnesia.....	.89
Pctash.....	2.12
Soda.....	1.16
Sulphuric acid.....	.25
Phosphoric acid.....	.41
Organic matter containin .11 nitro- gen.....	4.10
Water.....	2.28

Capillary capacity for water, 59.15.

No. 9.—*Loamy soil from field No. 8, Agricultural College.*

Selected by R. C. Kedzie.

Timber: Oak, beech and maple.

Sand and silicates .....	74.65
Alumina .....	9.66
Oxide of iron .....	4.18
Lime .....	1.46
Magnesia .....	.43
Potash .....	1.97
Soda .....	1.13
Sulphuric acid .....	.26
Phosphoric acid .....	.31
Organic matter containing .12 nitrogen .....	4.66
Water .....	1.25

Capillary capacity for water, 43.50.

II. *Peach Belt.*

The conditions that determine the successful cultivation of the peach in our state are climatic to a large extent. Yet the peach thrives best and produces fruit of finest quality on light, porous soils which are found in abundance along the eastern shore of lake Michigan. Yet fruit of good quality is produced on some of the heavy clay lands found in this belt.

No. 10.—*Peach belt soil, South Haven Van Buren Co.*

Selected by A. S. Dyckman.

Timber: Hemlock.

Sand and Silicates .....	87.23
Alumina .....	2.87
Oxide of Iron .....	1.52
Lime .....	.51
Magnesia .....	.46
Potash .....	.83
Soda .....	.34
Sulphuric Acid .....	.20
Phosphoric Acid .....	.13
Organic matter containing .07 nitrogen .....	3.41
Water .....	2.23

Capillary capacity for water, 44.70.

No. 11.—*Soil from Chase, Lake Co.*

Selected by J. Brown.

Timber: Maple, Elm, Hemlock, Basswood, etc.

Sand and Silicates .....	87.32
Alumina .....	3.22
Oxide of Iron .....	2.10
Lime .....	.62
Magnesia .....	.28
Potash .....	.90
Soda .....	.63
Sulphuric Acid .....	.10
Phosphoric Acid .....	.23
Organic matter containing .12 Nitrogen .....	3.78
Water .....	.55

Capillary capacity for water, 45.55.

No. 12.—*Soil from Eden, Mason Co.*

Selected by C. E. Resseguie.

Timber: Hemlock, intermixed with Hard Wood.

Sand and Silicates .....	92.43
Alumina .....	2.99
Oxide of Iron .....	1.23
Lime .....	.66
Magnesia .....	.12
Potash .....	.65
Soda .....	.23
Sulphuric Acid .....	.10
Phosphoric Acid .....	.22
Organic matter containing .03 Nitrogen .....	.87
Water .....	.27

Capillary capacity for water, 32.40.

No. 13.—*Sandy Loam, Eden, Mason Co.*

Selected by C. E. Resseguie.

Timber: Hardwood, mixed with Hemlock.

Sand and Silicates .....	75.27
Alumina .....	6.93
Oxide of Iron .....	6.10
Lime .....	1.00
Magnesia .....	.89
Potash .....	2.10
Soda .....	.90
Sulphuric Acid .....	.27
Phosphoric Acid .....	.30
Organic matter containing .09 Nitrogen .....	3.30
Water .....	2.92

Capillary capacity for water, 42.85.

*No. 14.—Soil From Ewart, Osceola Co.*

Selected by F. York.

Timber: Hardwood, mixed with Pine and Hemlock.

Sand and silicates.....	83.80
Alumina.....	5 10
Oxide of iron.....	3.24
Lime.....	.80
Magnesia.....	.64
Potash.....	1.19
Soda.....	.52
Sulphuric acid.....	.12
Phosphoric acid.....	.29
Organic matter containing Nitrogen.....	.07
Water.....	3.06
	1.24

Capillary capacity for water. 45.80

*No. 15.—Pine Land, Colfax, Mecosta Co.*

Selected by Fitch Phelps.

Timber: Heavy Pine Forest.

Sand and Silicates.....	75.54
Alumina.....	10.62
Oxide of iron.....	3.80
Lime.....	.94
Magnesia.....	.48
Potash.....	1.96
Soda.....	1.25
Sulphuric acid.....	.26
Phosphoric acid.....	.44
Organic matter containing Nitrogen.....	.12
Water.....	2.97
	1.44

Capillary capacity for water, 45.40

*No. 16.—Hardwood Lands, Big Rapids, Mecosta Co.*

Selected by G. W. Warren.

Timber: Beech, Maple, Basswood.

Sand and silicates.....	76.00
Alumina.....	10.00
Oxide of iron.....	3.41
Lime.....	1.14
Magnesia.....	.49
Potash.....	1.80
Soda.....	1.16
Sulphuric acid.....	.24
Phosphoric acid.....	.33
Organic matter containing Nitrogen.....	.10
Water.....	3.18
	1.90

Capillary capacity for water, 43.80.

*No. 17.—Hardwood soil, Sherman, Wexford Co.*

Selected by H. D. Griswold.

Timber: Maple, Rock-elm, Beech, Basswood and a little Hemlock.

Sand and silicates.....	86.74
Alumina.....	4.32
Oxide of iron.....	2.10
Lime.....	.65
Magnesia.....	.24
Potash.....	.83
Soda.....	.34
Sulphuric acid.....	.14
Phosphoric acid.....	.15
Organic matter containing Nitrogen.....	.11
Water.....	3.26
	.86

Capillary capacity for water, 44.00.

*No. 18.—Soil from Lake City, Missaukee Co.*

Selected by L. A. Barker.

Timber: Beech, Maple, Elm and some Pine.

Sand and silicates.....	69.39
Alumina.....	8.35
Oxide of iron.....	5.80
Lime.....	1.15
Magnesia.....	.98
Potash.....	1.95
Soda.....	1.15
Sulphuric acid.....	.25
Phosphoric acid.....	.28
Organic matter, containing .11 nitrogen.....	.473
Water.....	5.38

Capillary capacity for water, 39.10.

III. *The Potato District.*

Numbers 19 to 21 embrace several counties in the Traverse Bay region, where the soil is a sandy loam, rich in lime and potash. The fall of snow,

caused by proximity to the lake, often comes before the ground is frozen, and root crops may be left in the ground all winter without injury. The porous nature of the soil, the abundance of lime and potash, and the climatic conditions all contribute to the production of potatoes of superior quality.

No. 19.— <i>Potato Soil, Grand Traverse.</i>		No. 20.— <i>Potato Soil, Benzononia, Benzie Co.</i>	
Selected by C. F. Davis,		Selected by C. L. Northrop.	
Timber: Beech, Maple, Ash and Rock Elm.		Timber: Beech, Maple, Ash, Elm, Cherry,	
Sand and silicates.....		etc.	
Alumina.....	88.65	Sand and silicates.....	90.08
Oxide of iron.....	2.95	Alumina.....	2.86
Lime.....	2.60	Oxide of iron.....	1.50
Magnesia.....	1.37	Lime.....	.55
Potash.....	.41	Magnesia.....	.27
Soda.....	.89	Potash.....	1.10
Sulphuric acid.....	.32	Soda.....	.45
Phosphoric acid.....	.14	Sulphuric acid.....	.18
Organic matter containing .04 nitro-	.13	Phosphoric acid.....	.21
gen.....	2.05	Organic matter containing .07 nitro-	
Water.....	.49	gen.....	2.45
Capillary capacity for water, 40.20.		Water.....	.35
		Capillary capacity for water, 39.30.	

*No. 21.—Potato Soil, Elk Rapids, Antrim Co.*

Selected by Geo. E. Steele.	
Timber: Maple, Basswood, Elm, Beech and some Hemlock.	
Sand and silicates.....	84.68
Alumina.....	4.82
Oxide of iron.....	3.20
Lime.....	.95
Magnesia.....	.36
Potash.....	.98
Soda.....	.40
Sulphuric acid.....	.16
Phosphoric acid.....	.18
Organic matter containing .08 nitrogen.....	3.14
Water.....	.65
Capillary capacity for water, 52.10.	

IV. *Jack-Pine Plains. Nos. 22 to 25.*

In the northern central portion of the lower peninsula is a large tract of light sandy lands which have been called jack-pine lands, the barrens, the plains, etc. It is a light, sandy soil, of a brownish color from the presence of oxide of iron, very porous, and little retentive power for water. The principal timber is *pinus banksiana* (jack-pine), scarlet oak, with scattering trees of Norway pine and white pine. The subsoil seldom has any hardpan, and the water line in the soil is usually from fifteen to thirty feet below the surface of the soil.

The annual fires which sweep over these plains burn up the yearly accumulation of vegetable matter, and the soil contains very little humus. The small lakes have an abundant deposit of marl of good quality.

Some experiments have been made to ascertain the possibility of the use

of these lands for agricultural or grazing purposes, on the experimental farm at Grayling, Crawford county. Three specimens of soil from this experimental farm are offered for inspection and one of marl from a lake near by. By comparing No. 22, the soil in its natural condition, only fenced in and protected from fire for three years, with Nos. 23 and 24 which have been cultivated and enriched by plowing under the green crops raised without manure (green manuring,) the changes in the physical appearance and in chemical composition can be observed. The north field (No. 23) has raised successive crops of spurry, vetch, and peas, which have been plowed under. The south field (No. 24) has raised successive crops of spurry, peas, and red clover, all plowed under.

<i>No. 22.—Virgin soil from the experimental farm at Grayling.</i>		<i>No. 23.—North field of the experimental farm at Grayling.</i>	
Sand and Silicates.....	94.97	Sand and silicates.....	94.30
Alumina.....	1.03	Alumina.....	.61
Oxide of iron.....	.86	Oxide of iron.....	1.17
Lime.....	.20	Lime.....	.24
Magnesia.....	.12	Magnesia.....	.17
Potash.....	.20	Potash.....	.33
Soda.....	.90	Soda.....	.58
Sulphuric acid.....	.06	Sulphuric acid.....	.05
Phosphoric acid.....	.05	Phosphoric acid.....	.04
Organic matter containing .02 Nitro- gen.....	1.61	Organic matter containing .05 Nitro- gen.....	2.50
Water.....	.23	Water.....	.20

<i>No. 24.—South field of the experimental farm at Grayling.</i>		<i>No. 25.—Marl from the lake, Grayling.</i>	
Sand and silicates.....	95.02	Sand and silicates.....	1.90
Alumina.....	.49	Alumina.....	.14
Oxide of iron.....	.78	Oxide of iron.....	.10
Lime.....	.32	Lime.....	45.16
Magnesia.....	.15	Magnesia.....	.32
Potash.....	.30	Potash.....	.37
Soda.....	.62	Soda.....	2.65
Sulphuric acid.....	.05	Sulphuric acid.....	.56
Phosphoric acid.....	.01	Phosphoric acid.....	.01
Organic matter containing .04 nitro- gen.....	2.25	Carbonic acid.....	43.10
Water.....	.21	Organic matter containing .20 nitro- gen.....	5.69
		Water.....	.64

V. *Soils for special crops: Muck lands adapted to the growth of celery, cranberries, peppermint, etc. Nos. 26 to 28.*

Of all our kinds of soil, swamp muck has been most conspicuously held up to public opprobrium. Nothing good was said about it; nothing too bad could be said against it. Yet for certain kinds of crops it was found the best land in the world, and the fame of Michigan celery has gone into every state.

No one who has tasted Kalamazoo celery will forget its fine flavor, which has established its reputation far and wide. Many will look to the composition of the soil on which it is grown as the typical one for raising celery.

*No. 26.—Michigan celery soils: Kalamazoo celery soil from Kalamazoo, Michigan.*

Selected by J. Dunkley.

Sand and silicates .....	19.16
Alumina .....	1.40
Oxide of iron .....	3.94
Lime .....	6.09
Magnesia .....	.81
Potash .....	.34
Soda .....	.38
Sulphuric acid .....	1.31
Phosphoric acid .....	.88
Carbonic acid .....	1.95
Organic matter containing 2.53 nitrogen .....	63.76
Water .....	6.51

Grand Haven has also become a center for the production of this delicious and appetizing plant. The extensive deposits of muck near the mouth of Grand river afford a large field for this plant.

*No. 27.—Michigan celery soils: Grand Haven celery soil from Grand Haven, Mich.*

Selected by George Hancock.

Sand and silicates .....	24.09
Alumina .....	1.71
Oxide of iron .....	3.52
Lime .....	5.02
Magnesia .....	.62
Potash .....	.20
Soda .....	.33
Sulphuric acid .....	1.04
Phosphoric acid .....	.69
Carbonic acid .....	1.05
Organic matter containing 2.32 nitrogen .....	61.73
Water .....	10.85

But celery soils are not limited to the lower peninsula. A choice specimen of celery muck was received from the Newberry Celery & Improvement Co., at Newberry, Luce county. Superintendent H. L. Harris writes: "On this soil we have produced the finest celery grown in the state. The celery grown here has a fine, nutty flavor unknown to the celery grown in the southern part of the state. The soil is from sixteen feet to unknown depth, and there are thousands of acres of the same character of soil in our vicinity. We would also say that during the eight years we have been growing celery here we have not had a failure of crop."

*No. 28.—Michigan celery soils: Newberry celery soil from Newberry, Luce Co., Mich.*

Selected by H. L. Harris, superintendent of the Newberry Celery and Improvement Company.

Sand and silicates .....	24.56
Alumina .....	2.21
Oxide of iron .....	1.30
Lime .....	4.18
Magnesia .....	.75
Potash .....	.42
Soda .....	.40
Sulphuric acid .....	.67
Phosphoric acid .....	.46
Carbonic acid .....	1.10
Organic matter containing 1.75 nitrogen .....	63.75
Water .....	7.31

A comparison of these celery soils brings out the fact that, except in the amount of sand and silicates, the composition shows a close similarity. The common supposition that oxide of iron is especially injurious in celery soils is not borne out by these analyses. Sulphate of iron is very injurious, and when more than one per cent. is present no valuable crop will grow. A specimen of muck was sent here from Decatur which was barren from this cause.

#### PROPERTIES OF GOOD MUCK.

In the moist condition, all these kinds of muck have a deep brown-black color, the blacker the better; they are friable, easily breaking between the fingers, and are free from coarse, fibrous material; they have a pleasant earthy smell but no acid odor, and are entirely free from acid reaction. When moist muck of good quality is pressed against blue litmus paper so as to wet the paper, the blue color remains and no reddening takes place. Any muck that will redden blue litmus is unfit for cultivation while this acid condition remains. Sour muck is sorry material for cultivation. All the specimens of infertile muck that have been sent here for analysis—muck that would not grow weeds even—have been of this sour class and would turn blue litmus paper red very rapidly. By draining and weathering such soils by exposing to the action of frost, and especially by the application of lime, wood ashes, even leached ashes, the acid condition can be removed and these barren soils made to produce abundant crops of a certain class.

#### OTHER MUCK CROPS.

Celery is not the only plant that can be profitably raised on muck lands. Cranberry farms have been made on the mucky soil near St. Joseph and cranberries of superior quality produced. But success with this crop requires a soil free from acid; patches of sterile muck are often found in parts of cranberry fields, but in every instance the muck was sour.

Another crop distinctive of Michigan cultivation is the peppermint. The center of peppermint farming and distilling the oil seems to be in St. Joseph county. A request was made for a specimen of the muck that produced such large crops of the mint but none came. Another letter was sent which brought the following reply: "Yours of March 11th received. Your first communication was referred to ————, of this town, who is the largest mint raiser in the state, and who promised me he would forward the soil desired, but I saw him this morning and he said the ground was so frozen that he could not get it without being to greater expense than he wished to incur. The facts are that he does not want published to the world the benefits of reclaiming marsh land, for that is all there is in it. Any marsh land that can be drained so that it can be worked and still hold enough moisture to carry the crop through is good enough mint soil. \* \* \* I could go twenty rods from my store and get marsh soil and send you but it would not be essentially different from what you could get on the Agricultural farm."

My modest friend, the mint-grower, had "oil in his vessel," but was unwilling to "let his light shine before men." However, a college student brought a specimen of the mint muck, but too late for analysis and mount-

ing to exhibit at the World's Fair. It does not differ in appearance and properties from the Kalamazoo celery muck, No. 26.

VI. *General Purpose Soils. Nos. 29 to 38.*

This embraces a number of soils found in the central and northern counties of the state, which are of too miscellaneous a character to be placed in a more restricted classification. They are inserted to round out the list of Michigan soils that have been analyzed at this college.

*No. 29.—Gilmore, Isabella Co.*

Selected by P. H. Robins.	
Timber: Hardwood.	
Sand and silicates .....	88.13
Alumina .....	3.77
Oxide of iron .....	2.40
Lime .....	.87
Magnesia .....	.27
Potash .....	.86
Soda .....	.37
Sulphuric acid .....	.16
Phosphoric acid .....	.19
Organic matter containing .08 nitro- gen .....	2.35
Water .....	.52

Capillary capacity for water, 49.60.

*No. 30.—Midland, Midland Co.*

Selected by Gee. F. Ball.	
Timber: Beech, maple, oak and basswood.	
Sand and silicates .....	67.20
Alumina .....	6.31
Oxide of iron .....	7.91
Lime .....	1.64
Magnesia .....	1.23
Potash .....	1.85
Soda .....	1.15
Sulphuric acid .....	.30
Phosphoric acid .....	.49
Organic matter containing .22 nitro- gen .....	5.30
Water .....	2.10

Capillary capacity for water, 51.15.

*No. 31.—Sheridan, Clare Co.*

Selected by J. C. Rockafellow.	
Timber: Pine, hemloch, birch and maple.	
Sand and Silicates .....	93.31
Alumina .....	2.03
Oxide of iron .....	1.40
Lime .....	.36
Magnesia .....	.16
Potash .....	.54
Soda .....	.26
Sulphuric acid .....	.08
Phosphoric acid .....	.15
Organic matter containing .03 Nitro- gen .....	1.34
Water .....	.37

Capillary capacity for water, 43.10.

*No. 32.—Grant, Clare Co.*

Selected by J. C. Rockafellow.	
Timber: Maple, beech, basswood, ash, oak, etc.	
Sand and silicates .....	71.45
Alumina .....	6.50
Oxide of iron .....	7.18
Lime .....	.99
Magnesia .....	.73
Potash .....	1.90
Soda .....	1.20
Sulphuric acid .....	.19
Phosphoric acid .....	.36
Organic matter containing .16 Nitro- gen .....	5.90
Water .....	3.70

Capillary capacity for water, 44.90.

No. 33.—*Webber, Lake Co.*

Selected by George W. Townsend. "The  
Plains."

Sand and Silicates .....	92.48
Alumina .....	2.22
Oxide of iron .....	1.59
Lime .....	.35
Magnesia .....	.30
Potash .....	.73
Soda .....	.32
Sulphuric acid .....	.06
Phosphoric acid .....	.14
Organic matter containing .04 Nitro- gen .....	1.22
Water .....	.40

Capillary capacity for water, 35.30.

No. 34.—*St. Louis, Gratiot Co.*

Selected by S. S. Hastings.  
Timber: Pine, Beech, Soft Maple, Oak and  
Sassafras.

Sand and silicates .....	88.54
Alumina .....	3.11
Oxide of iron .....	2.15
Lime .....	.68
Magnesia .....	.30
Potash .....	.92
Soda .....	.26
Sulphuric acid .....	.15
Phosphoric acid .....	.14
Organic matter containing .06 Nitro- gen .....	2.82
Water .....	.41

Capillary capacity for water, 38.40.

No. 35.—*Bay City, Bay Co.*

Selected by Judge Marston.  
Timber: Not stated.

Sand and silicates .....	82.24
Alumina .....	4.60
Oxide of iron .....	2.42
Lime .....	1.18
Magnesia .....	.46
Potash .....	1.18
Soda .....	.54
Sulphuric acid .....	.20
Phosphoric acid .....	.38
Organic matter containing .17 nitro- gen .....	5.57
Water .....	.25

Capillary capacity for water, 47.30.

No. 36.—*Greenville, Montcalm Co.*

Timber: Not stated.

Sand and silicates .....	85.40
Alumina .....	4.50
Oxide of iron .....	2.80
Lime .....	.82
Magnesia .....	.31
Potash .....	1.13
Soda .....	.45
Sulphuric acid .....	.21
Phosphoric acid .....	.20
Organic matter containing .10 nitro- gen .....	2.75
Water .....	1.43

Capillary capacity for water, 37.80.

No. 37.—*Gaylord, Otsego Co.*

Selected by S. H. Crowl.  
Timber: Maple, Beech, Hemlock, Bass-  
wood, etc.

Sand and silicates .....	91.92
Alumina .....	2.93
Oxide of iron .....	.90
Lime .....	.40
Magnesia .....	.13
Potash .....	.61
Soda .....	.28
Sulphuric acid .....	.10
Phosphoric acid .....	.14
Organic matter containing .07 nitro- gen .....	2.20
Water .....	.39

Capillary capacity for water, 39.60.

No. 38.—*Tawas, Iosco Co.*

Selected by J. A. F. Scheffler.  
Timber: Hemlock, Pine, Beech and Maple.

Sand and silicates .....	80.06
Alumina .....	7.15
Oxide of iron .....	3.53
Lime .....	.93
Magnesia .....	.36
Potash .....	1.10
Soda .....	.38
Sulphuric acid .....	.19
Phosphoric acid .....	.16
Organic matter containing .09 nitro- gen .....	4.59
Water .....	.82

Capillary capacity for water, 63.80.

R. C. KEDZIE,

*Chemist of Experiment Station.*

AGRICULTURAL COLLEGE, MICH., }  
July 2, 1893.

## MINERAL RESIDUES IN SPRAYED FRUIT.

Part of Bulletin No. 101.—Chemical Department.

The practice of spraying fruits with certain mineral compounds to destroy insects and fungi has called out discussion in regard to the ripened fruit after such spraying, and its fitness for food. The subject has awakened an earnest discussion and many wild statements have been made on both sides of the subject. The first condition for intelligent discussion of any subject is to know the facts in the case.

The Horticultural department in 1892, and again in 1893, sent to the Chemical department specimens of fruit for analysis which had been sprayed during the season of growth, with a careful statement of the composition of the mixture used in spraying, the quantity used, and the dates of application.

Two kinds of spraying mixtures were used. No. 1 consisted of 1 lb London purple in 200 gallons of water; and 6 lbs of  $\text{CuSO}_4, 5\text{H}_2\text{O}$  (crystallized sulphate of copper) and 4 lbs of lime in 32 gallons of water, the spraying mixture (unless otherwise stated) consisting of equal measures of the London purple and the Bordeaux compound. The No. 2 spraying mixture differed only in the use of 2 lbs of the copper salt and  $1\frac{1}{2}$  lbs of lime for 32 gallons of water with an equal measure of the London purple mixture.

In stating the results of analysis the calculation is made on the basis of one pound avoirdupois of fruit, and the metals found in a pound stated in grains; the "arsenic" as white arsenic ( $\text{As}_2\text{O}_3$ ) and the "copper salt" as blue vitriol ( $\text{CuSO}_4, 5\text{H}_2\text{O}$ ).

## RESULTS IN 1892.

*Strawberries No. 1.* Sprayed with No. 1 mixture June 18 and 23, one half gallon on one rod of row. Picked June 24. Fruit excessively sprayed, the berries nearly covered with the mixture.

Arsenic found.....	.044 grains
Copper salt.....	4.87 "

*Strawberries No. 2.* Sprayed June 18 and 23 with No. 2 mixture, one-half gallon to rod of row. Picked June 24. Excessively sprayed.

Arsenic found.....	.0298 grains
Copper salt.....	1.821 "

*Red Cherries No. 1.* Sprayed June 18 and 30 with No. 1 mixture, one gallon to a tree. Picked July 6.

Arsenic found.....	.0882 grains
Copper salt.....	.390 "

*Red Cherries No. 2.* Sprayed June 18 and 30 with No. 2 mixture, one gallon to a tree. Picked July 6.

Arsenic found.....	.025 grains
Copper salt.....	.252 "

*White Cherries.* Sprayed June 30 with No. 1 mixture, one gallon to a tree. Picked July 1.

Arsenic found.....	.121 grains
Copper salt not estimated.	

*Red Currants.* Sprayed with London purple solution May 25, June 7, 18, and 30, one gallon to one rod of the row the first and second times and three fourths of a gallon the third and fourth times. Picked July 8.

Arsenic found.....	.0503 grains
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*Raspberries.* Sprayed with No. 2 mixture June 6 and 28 and July 8. Picked July 20.

Arsenic found.....	.0098 grains
Copper salt.....	.028 "

*Gooseberries No. 1.* Sprayed with No. 1 mixture June 18 and 29, July 8 and 22, one half gallon to a row two rods long. Picked August 2.

The fruit was first washed with 10 per cent. Hydrochloric acid to dissolve off the visible remains of spraying and the acid washings and washed fruit separately analyzed.

Arsenic in acid washings.....	.0186 grains
Copper salt.....	.463 "

Washed fruit:

Arsenic found.....	.0047 "
Copper salt.....	.138 "

Total residue found on and within the fruit:

Arsenic.....	.0233 "
Copper salt.....	.601 "

*Gooseberries No. 2.* Sprayed June 18 and 29, July 8 and 22 with mixture No. I,  $\frac{1}{2}$  gallon to two rods of row. Picked August 2.

Fruit washed with acid the same as the preceding specimen.

Arsenic found in acid washings.....	.0207 grains
Copper salt.....	.212 "

Washed fruit:

Arsenic found.....	.0165 grains
Copper salt.....	.150 "

Total residue found on and within the fruit:

Arsenic.....	.0372 grains
Copper salt.....	.362 "

*Pears.* Sprayed June 15, July 7 and 21, and August 7 with mixture No. I. Picked September 6.

Arsenic found.....	.0088 grains
Copper salt.....	.0738 "

## RESULTS IN 1893.

In the experiments with tree-fruits this year the Bordeaux mixture of 2 lbs copper salt and 2 lbs lime to 32 gallons of water was used for spraying the fruits on the tree. The London purple was omitted.

*Pears* were sprayed May 15, June 12, and July 10. One pound of the fruit gave the equivalent of .100 grains of copper salt.

*Russian cherries* were sprayed with Bordeaux mixture May 14, June 10 and 18, and on July 15 with modified eau celeste.

One pound of fruit contained .147 grains of copper salt.

*Plums* treated in the same way as Russian cherries, and at the same time, gave .2 grain of copper salt to a pound of fruit.

In these experiments, extending through two years, the minerals used in spraying the fruits were found in appreciable quantities in every instance, though the amount was small in all cases except when the spraying had been purposely excessive.

The inquiry naturally arises whether these poisons merely adhere to the surface or penetrate the substance of the fruit? The results with gooseberries seem to show that they penetrate the body of the fruit to a limited extent. A test of this question has been made with some of the sprayed pears. A pound of the pears was selected, the skin carefully pared off and burned by itself, and the body of the pear burned to ashes by itself and each ash separately analyzed. The pear peelings from 1 pound of pears gave .106 grains of copper salt, and the flesh gave .071 grains, showing that while most of the copper salt adheres to the surface, a portion finds way into the body of the fruits.

The copper salts adhere to vegetable surfaces more persistently than is commonly supposed. A student in chemical analysis (W. F. Wight), during the first week in May, 1893, made some investigations on this subject. The outside bark of trees that had been sprayed with Bordeaux mixture was gathered, burned to ash, which was dissolved in nitric acid and the copper plated out on a platinum dish and weighed. The results are calculated for 100 square inches of bark surface. The bark of a tree that was sprayed April 18, 1893, gave .124 grains of metallic copper. The bark of a tree more recently sprayed, and on which the spray was still visible, gave .28 grains of copper. The bark of an apple tree sprayed about one year before gave .05 grains, and the bark of a plum tree sprayed about June 1, 1892, gave .044 grains of copper.

The suggestion has been made that an opinion in regard to the safety in the use of such sprayed fruits as food would not be out of place. The condition where the poisons are applied directly to the fruit a short time before ripening is quite different from that where the poison is applied to one part of the plant while an entirely different part is used for food, such as the application of Paris green to potato vines to kill the Colorado beetle. So also the spraying of the young apples with Paris green soon after the blossoms have separated in order to destroy the larvæ of the codlin moth is quite different from spraying the developed and ripening fruit. The persistence with which such poisons adhere to the bark and other surfaces as shown in preceding experiments is quite significant.

The use of poisons in horticulture in my opinion is largely in excess of the amount required for a fungicide. One half or even one third of the amount usually employed would probably give as good results.

In the spraying of some fruits, such as strawberries in 1892, the amount

was purposely used in large excess. In one case nearly five grains of blue vitriol were recovered from one pound of fruit—a dose no sensible person would want to take in his food. Yet even that dose would not probably be fatal, though it might cause vomiting. Any of the doses of arsenic or of copper found in a pound of these fruits might be swallowed without endangering life by such single dose. It is the repeated doses, day by day, of such poisons that might produce slow poisoning and the gradual undermining of the health without obvious cause. It is safe to refuse all fruits which have been sprayed with these poisons (especially arsenic) during the period of ripening.

For a large part of the analytical work which forms the basis of this bulletin I am indebted to my assistants, W. L. Rossman and H. E. Harrison. I am fortunate in having such able and faithful helpers.

AGRICULTURAL COLLEGE, {  
*September, 1893.* }

R. C. KEDZIE.

## CELERY INSECTS.

BY G. C. DAVIS

Bulletin No. 102.—Entomological Department.

Michigan is peculiarly a celery state. It no doubt has enough swamp lands, of the peculiar muck soil, so requisite to the best success in celery culture, to supply the whole country, and certainly will make use of them largely for this appetizing plant in the near future. Every year brings an increased acreage. When celery was first introduced and raised only in limited areas, no insect attacks were ever reported, and probably none occurred, as an introduced plant is seldom attacked for several years. As several species acquired a liking for it, occasional reports of injury would be received. The past two or three years, the species that attack celery have so greatly increased in numbers and severity that the calls demanded a more extended knowledge which would assist both professional and amateur celery-growers to keep these little depredators in check by means of the best remedies that could be suggested. So far as can be ascertained, only two species have been reported in economic literature as celery insects.

But little celery is grown at the college, and what has been learned has been largely by frequent visits to the extensive fields at Kalamazoo, Tecumseh, and Jackson, and through correspondence with some of the most intelligent growers at these places. More might have been learned could the fields and myself have been in closer proximity, but the most destructive species are briefly described, illustrated, and remedies given. Many are spoken of that are not numerous at present but may be in the seasons following.

I wish to express my thanks to the members of the Board and the Directors of the station for their generosity and assistance in making this bulletin what it is, and to Mr. Russell of Tecumseh, and Mr. Wilson of Kalamazoo, and the many other celery growers at the various places visited, for their ever ready assistance in the field work. I am also very grateful to Mr. VanDuzee, Prof. Fernald, Prof. Osborn, Prof. Williams, the department at Washington, D. C., Profs. Cook and Wheeler of this college, and others who have so kindly assisted me in determining the various material gathered.

## LOCUSTS AND GRASSHOPPERS.\*

Owing to favorable seasons last year and this for grasshoppers and locusts, they have been very numerous and made their work felt on various plants—celery being one of the number. Those celery fields that have been surrounded mostly by high meadows, grain fields, forest or pasture lands, have suffered the most severely. It is on the drier, more sandy land that they are the most numerous early in the season, and then, as vegetation in these places becomes dry and partly dead, they avail themselves of the fresh and green fields of celery in the low lands. They will never be found on the low lands in numbers except in dry weather when they are driven from the uplands by a scarcity of food. The eggs are laid on sandy knolls or the mellowier parts of the uplands, and here the young hatch and attain considerable of their growth before they travel any distance.

If the fields where the hoppers breed could be plowed and thoroughly rolled in the fall, and kept under cultivation the following season, the hoppers would probably be considerably reduced in numbers. The roller is especially important as it is found that rolling crushes so many of the frail egg cases.

## THE MOST DESTRUCTIVE SPECIES.



Fig. 1. The red-legged locust, *Melanoplus femur-rubrum*. (after Riley.)

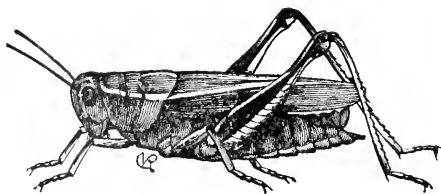


Fig. 2. The two-striped locust, *Melanoplus femoratus*. (after Riley.)

The species most frequently found and found in the greatest numbers was the common red-legged locust, *Melanoplus femur-rubrum* (Fig. 1). While no special study of the species on celery was made, it was evident that those common in meadow and pasture lands were proportionately common in celery fields. They stripped the celery of its leaves along the border as readily as that of any forage plant. Some of the species besides the red-legged locust that were common are the two-striped locust, *Melanoplus femoratus* (Fig. 2), and *Dissostertia carolina*. Of the common meadow grasshoppers, *Orchelimum vulgare*, *Xiphidium fasciatum* and *X. strictum*, and the katydid, *Scudderia fureculata* (?) were plentiful.

## REMEDIES.

A very good preventive, in one instance at least, that came under my observation while in one of the fields, was to leave a strip of land about

\*The term *locust* is applied in its more restricted sense to the brown hoppers with short horn-like antennæ, or feelers, and *grasshopper*, to the green hoppers with long thread-like antennæ, and will be so used in this bulletin.

four rods wide without plant growth. The instance cited was a strip used in the spring for a plant bed. It was along the end of a field next to a pasture field. The plants had all been taken up and transplanted in other parts of the field and the strip left idle until used for a late crop of celery. The locusts were plentiful along the border, but only a few wandered in far enough to reach the celery, while the other borders were suffering from locust invasions. The disuse of so large a strip of land makes this method of prevention rather expensive unless the surrounding land is of little value. The surrounding of the fields with ditches partly filled with water, although reported as effectual, is also quite an expensive outlay.

At my suggestion, Mr. Slater of Tipton tried sweetened bran with Paris green added, as suggested on page 4 in bulletin 98. He reports that he had no trouble in getting the hoppers to eat it, but was unable to tell whether it killed them or not. From some experiments conducted by myself there seems to be no doubt but that they are killed and quite quickly. The locusts were placed in three lots of which one was fed on molasses and bran with enough Paris green added to give it a green tinge, another the same with strychnine instead and the third without poison. Inside of twenty-four hours those fed on the Paris green were all dead. At the same time only one of those given strychnine was dead, and all were lively and active in the unpoisoned case. It is quite probable that Paris green used in this way will prove very helpful in keeping the number of locusts diminished, but care must be taken that it is not used where fowls or stock can get at it.

What at present seems to be the most effectual means of thinning the numbers is a modification of the "hopper dozer" spoken of and illustrated in bulletin 98. This modification was devised and used by Mr. C. H. Hardy of Tipton and, from his trial of various remedies through the season, he feels that this method is superior to all others. He bought large flocks of turkeys and chickens hoping they would keep the locusts in check, but they trampled the plants and ate the plume of the older ones and did not diminish the number of locusts as much in a day as two men would in a few hours with his hopper collector. The accompanying cut shows

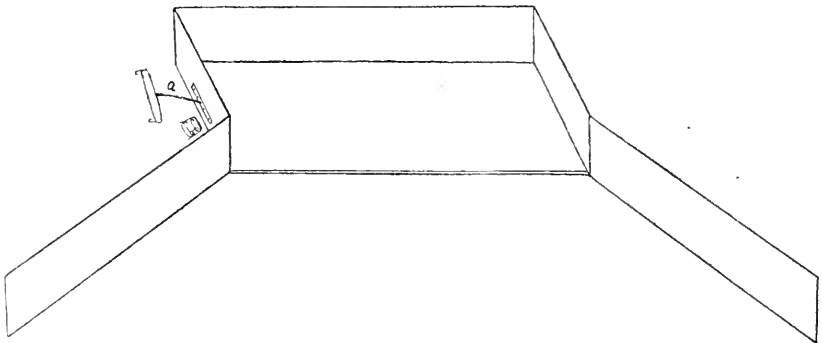


FIG. 3.—Modification of the "hopper dozer" as used by Mr. Hardy. *a*, Whiffletree attachment—(original).

the outline plan. The pan is made of sheet iron and is about 12 or 15 feet long by 4 to 6 wide. Then with a high fender on three sides and projecting wings from these and a whiffletree attachment at one end as at *a*, the mechanism is complete. The horse draws the pan to where it is to be set

on the grass at the border of the celery, then two men go into the celery and drive the locusts toward the pan. The two wings aid in crowding them into the center, and soon a large number of the hoppers are on the tar which has been previously coated over the inside of the pan. The collector is then driven up another space and the same operation repeated. Mr. Hardy used an old sugar pan with one side cut off and wings added. It is easier to collect the hoppers before their wings are fully developed, or in the cooler part of the day when they do not fly so readily. The regular hopper dozer is not practical in the celery fields as it must be raised so high to run over the plants without injuring them that the hoppers mostly go under the pan.

#### THE TRUE BUGS—ORDER HEMIPTERA.

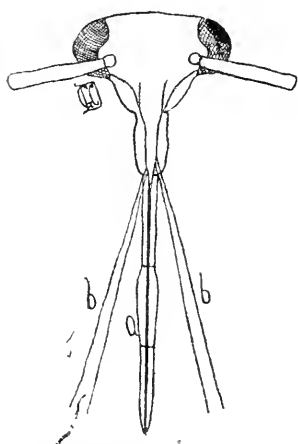


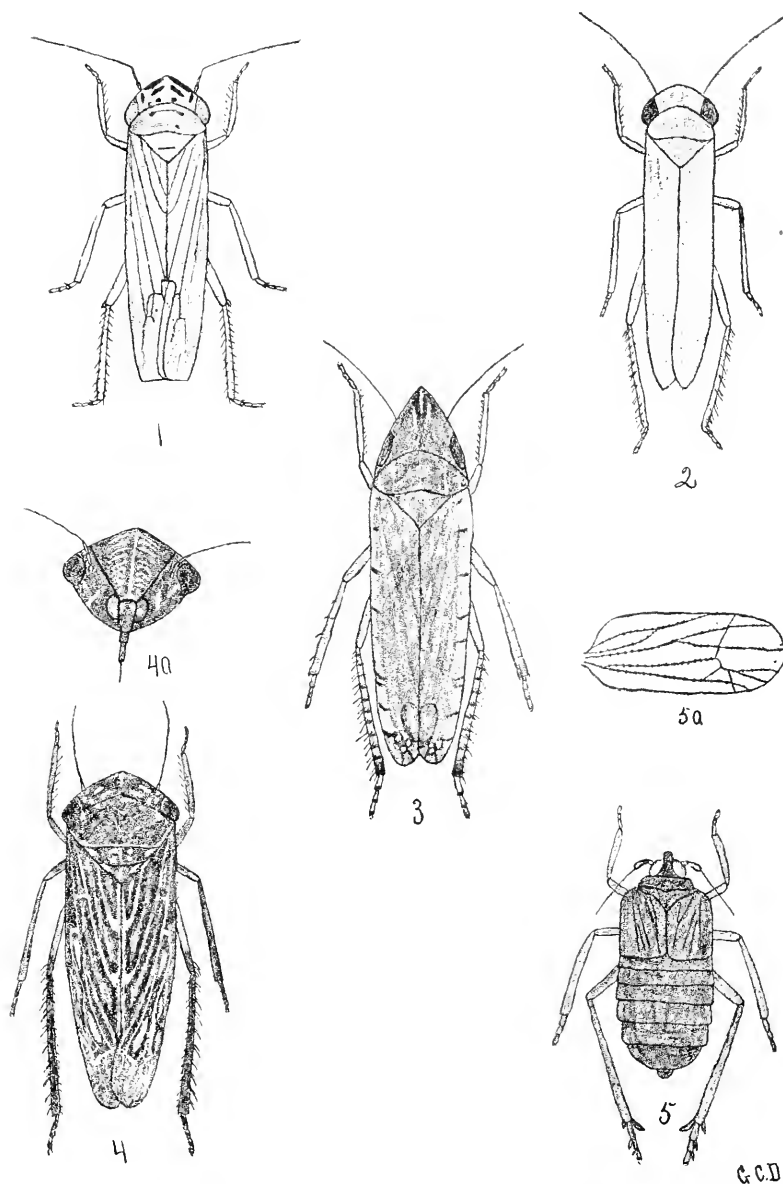
Fig. 4.—Head of the tarnished plant bug, showing the jointed beak, or rostrum, *a*, and the four needle-like mouth parts, *b*, used in piercing plants—(original).

This order of insects furnishes nearly one half of the celery pests, and several of the most injurious ones that we have. They do not bite or chew, but puncture the plant and draw the sap through the puncture. They are all characterized by having a beak. In the accompanying cut, the head and beak of the tarnished plant bug are shown. The four needle-like parts work together in the groove inside the beak, and, after they have pierced the plant, the sap is sucked up through this groove into the stomach. The beak does not enter the plant, but only presses against it. In the very young stage of this tarnished plant bug, the whole operation showed more plainly than any before observed. The piercing needles entered the plant as rapidly and apparently as easily as one could push a pin into a cushion. As the needles passed on through the stalk, the jointed beak became telescoped till it was all in two joints and scarcely half the length it was at first. It

is thought by many that these bugs injure the plants by secreting a poison when the sap is drawn. It is quite probable this may be so for the purpose of increasing the flow of sap. We all know of the mosquito poisoning for a similar purpose the puncture it makes.

#### LEAF HOPPERS.

All through the season, leaf hoppers were common on the celery. Early in the season they were especially abundant, usually flying ahead of one like a swarm of flies, as he passed through the field. When the plants are small, these leaf hoppers do a great deal of injury by sucking the sap from the plant through the thousands of little punctures that they make with their pointed, beak-like mouth parts (see 4a, plate I). While the plants, for the first few weeks after transplanting, are having their hardest struggle for existence, the little leaf hopper's work is the most destructive. This season many fields of celery were retarded in growth at this period. This is a part of the season when the celery grower can the least afford to allow any interruption in the growth of his plants.



G. C. Davis

PLATE I.—Fig. 1, *Cicadula 4-lineata*; 2, *Empoasca mali*; 3, *Platymetopius acutus*; 4, *Athysanus instabilis* n. sp.; a, front view of the head showing clypeus, lora, cheeks and front; 5, *Megamelus piceus* n. sp.; a, complete wing of macropterous form. All drawn ten times the natural size.

## SPECIES THAT WERE MOST NUMEROUS.

1. *Cicadula 4-lineata* Forbes (Fig. 1 of plate I) was the most common species everywhere. At the college and where the muck had considerable clay in it, they could be taken by the hundred at almost any time in the season. The species is greenish brown, with yellow scutellum, and head spotted as shown in the figure.

2. *Empoasca mali* Le B. (Fig. 2 of plate I). This is a pretty little yellow species with transparent greenish wing covers and green legs. It was very common through the season after July. At Kalamazoo many were found down in near the heart on blanching celery. It is probable that they help spot the white stalks. They breed on the plants.

3. *Platymetopius acutus* Say (Fig. 3 of plate I) was common the latter part of the season. The young were found on the plants early this fall. The species probably does little harm as it prefers to be high up on the leaves instead of on the stems. To the naked eye it is a dark brown and can be easily told by the acute projection of the head.

4. *Athysanus instabilis*\* n. sp., Van Duzee (Fig. 4 and 4a of plate I).

Form of *Deltocephalus inimicus* Say. Black, dotted and marked with fulvous as follows: hind edge of the vertex, a dot, sometimes wanting, touching this either side of the middle, another near each eye, two marks on the disc, a line before each of these, an angular mark at apex including a short longitudinal dash, a dot on the temples, six or eight arcs and the central line on the front, the latter expanded on the clypeal suture, two dots on the base of the clypeus, another on each lora, a spot on the cheeks and their slender outer edge, the irrorations of the pronotum and a few large spots on its anterior edge, six spots on the scutellum—four marginal and two discal—and its median line, knees, a transverse band on the femora and the slender hind edge of the abdominal segments. Posterior legs pale, more or less clouded with fuscous, with the inner face of the flattened tibia black. Elytra pale, slightly clouded at apex, the areoles broadly margined with fuscous, nervures whitish. Last ventral segment of the female long, feebly arquated either side of the middle, with the lateral angles prominent. Valve of the male short, plates triangular subacute. Length 4-4½ m. m.

Quite common at the college through August and September. Mr. Van Duzee has the specimens of the same species from Colorado also.

5. *Megamelus piceus* n. sp., Van Duzee (Fig. 5 and 5a plate I).

Piceous-black; base of the vertex, keels and narrow hind edge of the pronotum, disc of the mesonotum, or at least its carinae, disc of the tergum, especially towards its base and apex, and the edge of the dorsal keel; the genital segments and sometimes the base of the venter, brownish yellow. Face pale shaded to brown above, clypeus deep black. Antennae, rostrum, tylus, and legs pale, soiled yellow, the later lineate with brown. Elytra reaching to the second abdominal segment in the brachypterous form, with the apex truncated, piceous-brown, or even black, with the apical edge white more or less broadly interrupted with black at the middle; nervures strong, granulated. In the macropterous form the elytra extend considerably beyond the tip of the abdomen about as in *Liburina pellucida*; they are smoky with pale granulated nervures, the exterior and interior of which are forked at about three-fourths their length. Pygafers of the male cylindrical, on their ventral aspect cut out for about one-half their length and carrying on the broad base of this incisure a broad and short projection extended into a short conical divergent tooth at each angle, beyond this are the incurved spine-like stylets included between the long slender ventral projections of the plates. Length, 2½ to 3 m. m.

New York and Michigan. Described from many examples of both sexes taken in western New York on grass in low swampy meadows in August and September, and one female taken on celery at Kalamazoo, Mich., August 26, 1892, by Mr. G. C. Davis.

In this species the vertex is shorter and broader, the pronotum shorter and the meso-

\* This and the following species were found to be new to science and Mr. E. P. Van Duzee, a specialist on Jasside, to whom they were sent, has kindly consented to describe them. His same descriptions will also appear in the Canadian Entomologist.

notum longer with more divergent carinae than in *M. notulus*. The yellowish markings above vary much in extent, some specimens being almost entirely of a dull piceous-black while some are pitchy brown with the pale markings much extended. The characters of the head, the pale face and the black vertex and clypeus seem quite constant as does also the color of the tylus, rostrum, legs and elytra.

Of the others species *Phelpsianus irroratus* Say and *Agallia sanguinolenta* were quite often taken; *Tettigonia noveboracensis*, *Thamnotettix clivellaria* *Deltocephalus melsheimeri* Fitch and *D. inimicus* Say, occasionally taken. No extensive collecting was done in getting this material. To secure specimens of those most common on celery rather than a complete list was the object.

#### REMEDY.

Owing to the fact that leaf hoppers do not feed by chewing the plant, but live on sap taken from the inside of the stem or leaf, most of our insecticides are of little avail. This being the condition and the hoppers so injurious to the young plants, another method was devised that has

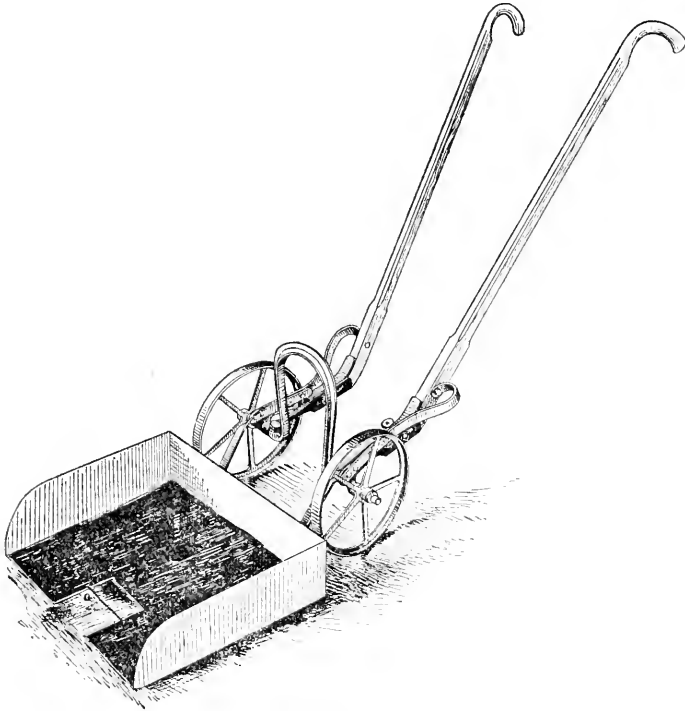


FIG. 5.—The hopperette used in collecting leaf hoppers, flea beetles and many of the celery bugs. *a*, string—(original).

succeeded even better than my first anticipation had predicted. It is by means of a small tarred pan attached to a hand wheel hoe as in Fig. 5. The pan is made of sheet iron. The bottom is 16x20 inches with a notch

six inches deep by four wide cut in the center of the front edge. On the two sides and back is an upright sheet about four inches high to prevent the leaf hoppers jumping over. The edges of the front side and notch are rolled up merely sufficiently to prevent the tar on the bottom from running off; one eighth of an inch is ample. The hopperette, as we will designate this collecting pan, is attached to the wheel hoe by two strips of strap iron fastened under the pan as a support and at the other end bolted to the frame of the hoe or fastened in any way that will make it solid. The shaping of these braces and the lowering of the pan depends entirely upon the make of carriage used. The one used in my own experiments was a two-wheeled hoe sold by D. M. Ferry & Co. under the title "Planet Jr." With this machine the pan was lowered five inches below the axle, which brought it very close to the ground and still kept it level. When placed entirely in front the pan can be raised or lowered considerably to conform to the uneven surfaces on the ground. The notch cut in the bottom is a great aid as it permits the plant to be nearly surrounded before it is disturbed and all insects are caught that jump to the sides as well as back. Another feature that added considerably to the efficiency of the hopperette was a strong twine string stretched across the notch about four inches in from the edge, as at *a*. This not only protects the plants from the sharp edges, but causes the hoppers to leap at the right time. If the holes punched for the string cut it, eyelets may be used or a wire about the same size may be used.

#### COST OF HOPPERETTE.

The first cost for collecting leaf hoppers in this way is very slight and it takes comparatively little time in collecting, as a man can pass over a considerable area in a day. The pan made of sheet iron cost \$1.25. There is no patent on this or the collector spoken of under locusts and they may be made by any tinner. The coal tar used in coating the pan is very cheap. Enough of the tar should be kept in the pan to occasionally run over the bottom and recoat it, and by this means cover over refuse material and insects that have accumulated. Those who may wish to purchase a "Planet Jr." for use in the celery fields and for leaf hoppers too will find it listed in D. M. Ferry & Co's catalogue at \$4.00. With an outlay of not over \$6.00, and a few hours' work, many times that amount will be saved in the celery crop where the little leaf hoppers are at all thick. One may not realize how many there are of them till he stirs the plants and watches the number hop away. In my first trial of the hopperette, the hoppers were not as common as a week or two earlier, but on a row five rods long at least two hundred were caught.

#### THE TARNISHED PLANT BUG (*Lygus pratensis* Linn).

##### ORDER HEMIPTERA.

##### FAMILY CAPSIDÆ.

A brown bug that is the cause of the rusty, dead spots and streaks on celery known among growers as one form of "sun scald," but different from the disease known as leaf spot, which will be treated of later.

Although not found in such great numbers as some other pests, the tarnished plant bug is one of the worst with which the celery-grower has yet had to contend. It goes directly to the tender stalks of the plant that are blanching and by means of its beak draws the sap from the stem, and

leaves a large brown wilted spot which greatly mars the attractive appearance on the market and lowers the price accordingly. I do not remember of talking with a celery-grower this season, who knew the real cause of these brown spots on celery. The most general belief was that it was caused by "sun scald," or perhaps bruised in blanching. This is not at all surprising as the bug is so shy and retiring, when one is near, that it is only by quiet and careful watching that it is seen feeding. Then, too, it

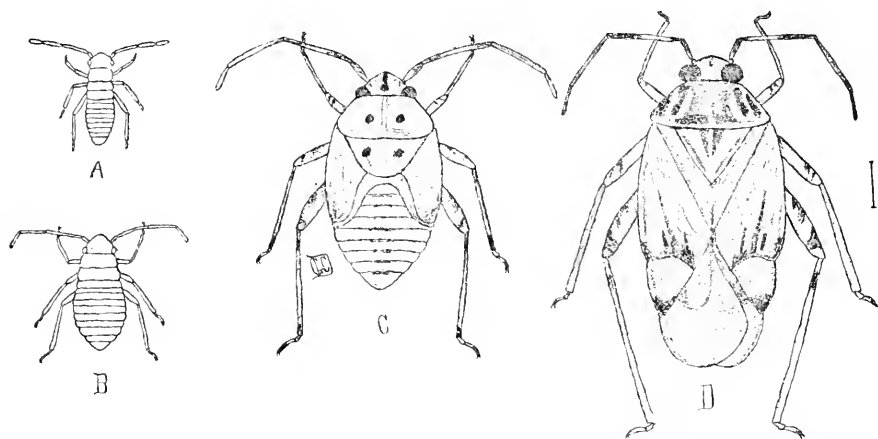


FIG. 6.—The tarnished plant bug, showing the various stages of growth. A, very young bug; B, second stage; C, the fourth stage; D, the matured, winged form. The line at the right shows the natural size —(original).

is almost always well in toward the center of the plant and is protected largely from view. Very often when disturbed, or even on the approach of possible danger, the mature form will take wing and fly away, and the younger ones not having wings will drop to the ground and seek protection there.

#### LITERATURE.

The tarnished plant bug is a native of nearly all parts of our country. For this reason, coupled with its general destructiveness, it has been made the subject of many articles. Nearly all are brief notices of injury done. The only really extensive or exhaustive article on the species is by Prof. Forbes in the 13th Illinois Entomological Report, 1883, pp. 115-135 (Ill.). All of the more important literature is referred to here. The work treats of the bug as a strawberry insect, causing the berries to shrivel by sucking the juice from them. Pyrethrum is the remedy recommended. In the following year, report 14, pp. 79-80, additions to the previous report are given in which Prof. Forbes describes the egg of the bug and records an experiment with pyrethrum not working as well as expected.

Several other authors have before and since written short accounts of it as a strawberry bug.

The earliest important article was by Dr. Harris in "Insects Injurious to Vegetation," pp. 199-203. Under the name of *Phytocoris lineolaris*, he treats of it as injurious to flowering plants and potato vines, and recommends simple but as inefficient remedies.

## THE DIFFERENT STAGES OF GROWTH.

As a usual thing it is only the larger winged form that we notice, the young forms remaining concealed in the denser part of the plant. The common name, tarnished plant bug, is a very appropriate one for the adult, as it has a stained or tarnished appearance, though still retaining a polished surface. It is a very variable species in its markings, and has until recently been considered as several distinct species. The females, as in the figure, are quite a light brown with yellowish white markings; the males, a dark reddish brown with scarcely a light marking. Intermediate markings, ranging between the two extremes, may also be found. There are four distinct stages of growth between the egg and the mature form; the first, second, and fourth of which are illustrated in the accompanying figure. The small line at the side shows the natural size. The first two stages are entirely wingless, and in color are a light green. They resemble the plant very closely, and this affords them a means of protection which they often make use of by keeping very quiet on the stalk of like color and so are easily overlooked. The next two stages begin to show evidences of the wings, quite small in the first but very distinct in the next. They are still green with a very few dark markings, but the color does not seem to be used much as a protection in these two stages.

## THE LIFE HISTORY.

Early in the spring the first insects to make their appearance on early vegetation are the imagos (adults) of the tarnished plant bug. They have lived through the winter in this form, under boards, bunches of dead leaves, grass, rubbish, or anything that they can find which will give them shelter. They are very general feeders as will be readily seen in looking for them on the plants in one's immediate vicinity. They feed on all the common weeds as well as grass, clover, and plants raised for their flowers. The fruit, blossoms, and foliage of the pear, apple, quince, strawberry, and grape suffer alike from their piercing beaks. Our vegetables suffer in the same way. They not only feed on these plants but breed on them also. Early in the season the eggs, described by Prof. Forbes as minute, white, smooth, slender, oblong ova, are deposited on the plant. From these the young soon hatch. They are at first very slender for their size, but, as they grow older, the imbibing of so much sap tends to expand the body much faster than it lengthens. From the first part of June through the remainder of the season, all stages from the youngest up could be found on the celery, though at times certain stages were more common than others. Before the cold autumn weather becomes severe, the adults are again in winter quarters.

## BEST MEANS OF FIGHTING THE BUG.

A great many insecticides have been tested only to find them ineffectual and unsatisfactory. Owing to the bug sucking its food from the inside of the plant, no remedies affect it except those that kill by contact. Of these, the kerosene emulsion, so often recommended in our previous bulletins, is probably the best, but as the bugs are so shy and hide, or take flight so readily, a large per cent. of them escape even with the most thorough work. It was noticed that in collecting leaf hoppers with the hopperette,

quite a number of tarnished plant bugs were also collected and it seems probable that this is a quicker and cheaper means of fighting them than is any insecticide.

As prevention is better than cure in disease, so it is with this bug, and we must look largely to this means in keeping it in check. The relation between the number of bugs and the manner in which the celery fields and surrounding borders were kept, was very noticeable in every celery field visited this season. If long grass, weeds, loose sods, or boards were left scattered along the border or in the vicinity of the field, the bugs were sure to be there in greater numbers than where everything was kept picked up and cleaned up so that the bugs could find no protecting shelter in which to hibernate. This is the reason certain localities suffered so much more than others. Occasional exceptions in locality were seen, but where such occurred the bugs were scarce in proportion to the care used in keeping rubbish cleared from the fields.

The loss produced by the bug is impossible to estimate as it is not a total loss of celery, but only a decrease in the market price. The loss in this way is a serious one as every celery-grower who has a poor article to put on the market well knows; and when it can be avoided, at least the most of it, by a little care and tidiness, it is well that all such precaution be taken.

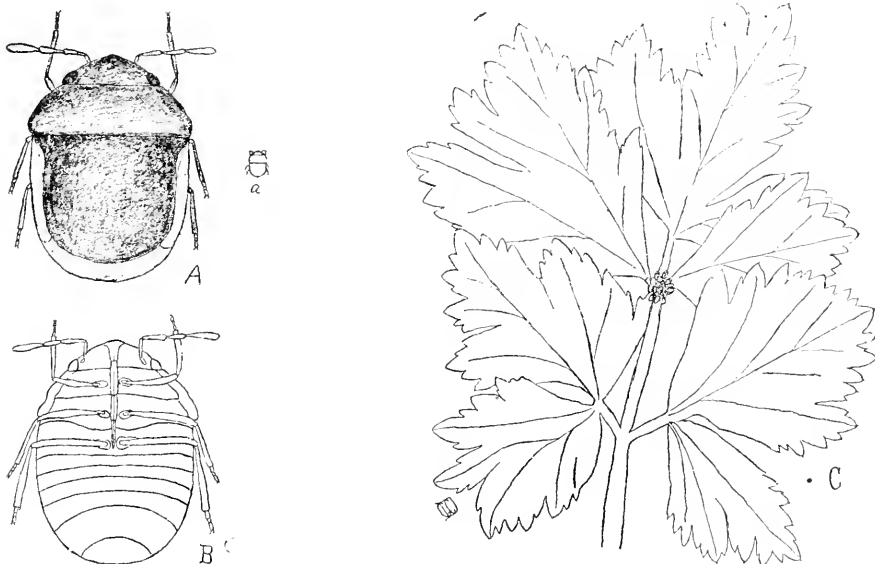
### THE LITTLE NEGRO BUG (*Corimelaena pulicaria*, Germ).

ORDER HEMIPTERA.

FAMILY CORIMELAENIDÆ.

The little black bug which appeared so suddenly and in such great numbers on celery this season. It kills the leaves and dwarfs the plant. By the remedies suggested it is thought it can be controlled.

Fig. 7.—The little negro bug. A, upper side much enlarged, a, natural size; B, under side of the same showing the beak; C, section of a leaf with bugs at work—(original).



No celery insect up to the present time has caused more alarm over the State than this species did the past season. It came so suddenly and in such great numbers at Tecumseh that for a time it appeared as

though many fields would be cut to the ground in a few days. The attack was quite general all over the celery-growing portions of the state, but not so severe as at Tecumseh and vicinity. The fields at Jackson suffered slightly, and one field at Kalamazoo was quite badly injured. The bugs appeared on the college celery but did no harm.

On the 22d of July letters from Tecumseh and vicinity began coming in, asking for information and help. The following may be taken as a sample of those received.

"DEAR SIR—I mail you a box containing some bugs. Millions on millions have commenced work upon our celery, from twenty-five to fifty collecting about one leaf and in an hour or two it is gone. \* \* \* They are doing great damage and if they last many days, will do many thousand dollars' worth of damage. Please state if there is any remedy and how long they will last and what you know about their habits. Please answer at once.

Yours truly,

E. L. RUSSELL."

Several similar letters being received the same day made it imperative that something be done, and before Mr. Russell's reply reached him, I was in his field of bugs and celery.

#### METHOD OF ATTACK.

The attack was very sudden and severe and Mr. Russell's statement was found to be no exaggeration. They had not acquired possession of the entire field, but were extending their domain daily. The first thing that would be noticed in the attack upon a plant was a knot of little black bugs around the node where the three top leaflets met, and here they would suck the sap till the leaflets wilted and drooped, when they would go down to the next joint below and so repeat the operation till the leaf was drained of its sap; then they would pass to another leaf and attack that in the same way. They always went in bunches of usually from fifteen to thirty when feeding. With so many little beaks drawing the sap from the leaves, it is no wonder the destruction was so rapid and alarming.

The attack was almost invariably made on the highest leaves. When one of them was cut down to the denser part of the foliage, the leaf would be left and others reduced to the same level. When they came to the plume (central white leaves), it suffered the same and then the plant was spoiled for market. This habit of taking the highest leaves first is no doubt due to their love for heat and sunlight which they could not have when below the crowded central leaves. In looking over a field after the bugs have worked in it a few days, it has the appearance of having been clipped off about half way down and the dead leaves left just where they had been cut off. The plant would be in a much better condition after recovering from a clipping than from an attack of this kind, as the dead leaves are still attached, which in itself is harmful, and then they so completely cover the living part that it is almost entirely shaded.

In their attack the bugs showed a great preference for the older celery that had commenced to grow stalky and was nearly ready to blanch or was blanching. The younger celery, where the leaves were spread out and the center exposed, was injured comparatively little. Where the bug did work on such plants, they were found sometimes on some of the higher leaves as described before and sometimes in little groups around the heart stalks.

## THE EFFECT.

As the heart stalks of celery form the edible part of it, the bugs could not have attacked any other part of the plant where as little harm would be done as on the higher and older leaves. Then, too, the severest part of the attack did not last over three weeks. It was the attack of such countless numbers that made their work so severe. Most fields at Tecumseh suffered less than was at first feared, but where the bugs were abundant the loss to celery was considerable. Plants, that had suffered a severe attack, were retarded in their growth from two to three weeks, and when they appeared to have recovered it was not with the same large, perfect stalks, so characteristic of Tecumseh celery, but with a large number of little, curling, gnarly stalks that would be of little or no market value. We might as well say that in such cases the crop was an entire loss.

## NOT THE CHINCH BUG.



Fig. 8.—Chinch bug  
(*Blissus leucopterus*).

Owing to the sudden appearance of this little negro bug, a great many in the region thought it surely must be the chinch bug. Some were not convinced till specimens of the chinch bug were sent from Iowa and compared with the negro bug when they at once saw a great structural difference. Both have the odor peculiar to all similar bugs and have a beak for sucking, but are very different in most respects. The form, as will be seen in the two cuts, is entirely different, and the chinch bug is not shining black, but a dull, dusty brown with the terminal half of the wings membranous. There is little danger of a chinch bug invasion so far north in Michigan as the celery fields.

## GLEANINGS FROM LITERATURE.

Before we attempt to suggest any remedies let us learn more about the little negro bug's habits, and what others have learned of it.

The earliest account of its destructive habits that was found is an article in the *Canadian Farmer* for August, 1867, where Rev. C. J. S. Bethune speaks of its attack on strawberry plants in Canada.

In the same year B. D. Walsh, in the *Practical Entomologist*, Vol. II, p. 119, reports it as swarming on raspberries in Missouri in such numbers as to render the berries worthless both from odor and taste.

Walsh and Riley, in the *American Entomologist*, report it as puncturing strawberries and causing the blossoms and fruit to wilt; also as attacking the cherry, quince, and pear in the same way. The remedy suggested was cresylic soap, which has long since been superseded by better remedies.

Dr. Riley, in his second *Missouri Report* (1870), gives a review of the plants attacked and reports it very common all over the state the year before.

In the *Prairie Farmer*, August 15, 1868, he reports a new growth of stems and leaves of grape vines injured by it.

In the U. S. *Agricultural Report*, 1884, p. 390, Mr. Webster reports breeding the bug on wheat.

Prof. Forbes in his *Illinois Report* for 1890, p. 51, reports it common in

wheat and grass fields along with the chinch bug, and for this reason often considered injurious by farmers, but it seemed to feed only on weeds.

There are a few other minor references, but these give us something of an idea of its habits and the cultivated plants attacked. It always has been known best as a strawberry insect, because the oftenest found injuring that plant. The above references are all largely incidental, but with these and what has been learned of it on the celery this season, we are enabled to more closely determine its

#### LIFE HISTORY.

We owe thanks to Mr. Webster for assistance by his notes on the early stages of this bug, as it is single-brooded and the first brood was mature when found on the celery. His record is: "Adults were observed copulating May 9, and were at once confined on wheat under glass, being fed on ripe strawberries. The females began to oviposit on the 20th, placing their eggs singly on the leaves and sheath of the grain. On the 26th, after depositing a few eggs in the intervening time, they made their escape. The eggs may be described as follows: Length,  $\frac{3}{8}$  m. m.; diameter,  $\frac{2}{5}$  m. m.; form elongate oval; and when first deposited the color is shining, very light orange, which gradually deepens until just previous to hatching, when it is a livid red. One of these eggs, deposited on May 21, hatched June 6, the larva being  $\frac{3}{8}$  m. m. in length, brown anteriorly and red barred with brown posteriorly, legs yellow."

Careful search was made for the nymphs through the celery, and only a short distance on one row next to a ditch, were there any found, and then only an occasional one. They were like the mature form except the abdomen was blood red, soft, and segmented. These fed in the group along with the adults. After reaching the mature stage they lose their appetite in about three weeks, so that after the 10th of August this year they did the celery no harm and gradually disappeared. Those kept in the breeding jar have not cared to feed, but have collected in crevices in a semi-torpid state awaiting the coming of winter. They hibernate under boards and rubbish as does the tarnished plant bug.

#### PREVIOUS APPEARANCE ON CELERY.

With only one exception, no one, when asked regarding the bug, had ever seen it at work on celery before. This one was Mr. Frenthway of Kalamazoo who says he has seen it on his celery for the past seven years; only a few each year, not enough to do any harm. It certainly never has been numerous or others would have noticed its work.

#### DOES IT BREED ON CELERY?

This is a question which was studied very carefully while in the fields, and while it can not be said positively that they do not breed on the plant at all, yet it seems very certain that such is the case. In every instance where the bugs were the worst, a rank growth of weeds was found near by. In most instances the weeds had been cut only a few days before the bugs appeared on the celery; but in some cases the weeds, while still standing, were nearly deserted and the celery attacked. The border of the celery field nearest the weeds always showed the first signs of attack,

and was injured the worst for the first few days, after which the bugs would scatter so that no difference could be noticed.

The bugs are not general weed feeders like the tarnished plant bug, but are partial to a select few. They were found feeding on five different species bordering the celery fields, viz: \*beggar-ticks, stick-tight or fork weed (*Bidens frondosa*); tick-seed (*Coreopsis trichosperma*); red root (*Amarantus retroflexus*); ground nut (*Apios tuberosa*), and great lobelia (*Lobelia syphilitica*). In addition to these Dr. Riley reports them on rosin weed (*Silphium*) and speed well (*Veronica peregrina*); Webster, on evening primrose (*Oenothera*); Forbes, on plantain (*Plantago lanceolata*), and sometimes on rag weed (*Ambrosia*) and smart weed (*Polygonum persicaria*). When found on these weeds they are always more plentiful than on celery near by; but in some instances where found in large numbers on these weeds a few days previously, the weeds had been deserted and the celery attacked. All seems to point toward their breeding elsewhere than on the celery at present; but even if this is true, should they continue to make celery a food plant, they will undoubtedly make it a breeding plant as well.

#### INEFFECTUAL REMEDIES.

While celery-growers should not be discouraged at the start, for it is probable the bug can be controlled, yet it is quite evident after experimenting with the remedies usually effectual on such insects, that nearly all the remedies belong to this first class—the ineffectual. Our most effectual remedy on the true bugs is kerosene emulsion and this was the first to be tested on these bugs, but they were too well armored for it to penetrate. They were even placed in the dilute emulsion and forced to swim for five or ten minutes, but they soon recovered when taken out and were as lively as before. The full strength emulsion that would kill the tarnished plant bug as soon as dropped into it, would not kill the little negro bug for several minutes. Similar in nature, but even less effectual was "Little's Chemical Fluid," a prepared sheep dip and insecticide.

#### THE MORE EFFECTUAL REMEDIES.

Finding our most effectual remedies that kill by contact were of no avail, we next turned our attention to repellants and here found a vulnerable point. They were driven and scattered by offensive odors. Crude carbolic acid mixed with water at the rate of a tablespoonful to two gallons and sprinkled over the plants or mixed with air-slaked lime or land plaster at the rate of a teacupful to each bushel and dusted over the plants, seemed to serve as a repellant the best of anything tried. The odor from a field sprinkled with carbolic acid water could be detected quite a distance off for at least twenty-four hours after the application was made. The odor from carbolized lime is not nearly so strong but seems to be more permanent. Lime alone was of little effect. It was intended to procure some gas lime (a refuse product in the manufacture of gas), but none could be obtained, and ammonia water with a strong sulphur and coal tar odor was taken instead. For the plants it had to be reduced at least seven eighths, but the bugs could swim in it full strength without appar-

\*The plants were determined for me by our station botanist, Mr. C. F. Wheeler.

ent injury. As a repellant it did some good, though not equal to carbolic acid. Other repellants, such as coal-tar water, salt, sulphur, etc., were tried but were of no evident effect.

The only remedy found which would *kill* the bugs was hot water. Celery will endure a stream of water heated to 175° Fahrenheit, and the bugs succumb at 155°.

#### MEANS OF CONTROL.

We now come to the most important part, viz.: how to protect from future attacks. With the present knowledge that we have, probably the best method will be a combination of the carbolic acid and hot water. It is probable that the bugs will appear about the same time again next season, and careful watch should be kept from the 10th of July on. When they appear it will be in large numbers in some spot along the margin, and this is the time to treat them before they spread over the field. Carbolic acid can then be used on the plants surrounding the bug-infested patch for some distance back, or to make it more certain, on the remainder of the field; then, while the bugs are held in this little patch, dose them with hot water. It should be between 155 and 175 degrees Fah. when it strikes the bugs. The use of hot water is impracticable in a large field, but if used only on a little patch, is not so difficult. It may be applied with a cup from a pail or with a spray pump without the spraying nozzle. The water must be thrown in a stream, as it will cool too rapidly when thrown in a spray. The application of hot water will necessitate the use of a thermometer that the temperature may be accurately known.

A good precaution against attack would be to keep all weeds in the vicinity of the celery fields and along ditches cut down close through June and July so as to prevent the bugs from breeding on them. Unlike the tarnished plant bug, the amount of rubbish under which the negro bug can hibernate does not seem to affect its numbers in the least.

#### THE 13-SPOTTED LADY BIRD BEETLE (*Hippodamia 13-punctata*, Linn.).

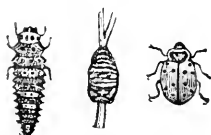


FIG. 9.—The three stages of the 13-spotted lady bird beetle, nat. size.

Many suspected this spotted beetle, which was so often present with the little negro bugs or found at the node after it was left by the bugs, of helping harm the celery; but the beetle was there only for the sap that issued from the wounds made by the bug. The beetle is one of our little friends as it feeds on plant lice and seldom, if at all, on the plants themselves.

THE THREE-LINED THRIP (*Coleothrips trifasciata*, Fitch).

ORDER HEMIPTERA.

FAMILY THRIPIDÆ.

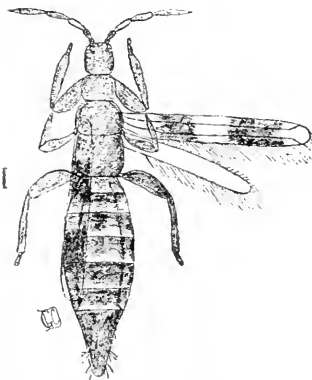


FIG. 10.—The three-lined thrip; wings in natural position on one side and spread on the other. The line at the side shows the nat. size —(original).

In June and July these very minute sap sucking insects were common on the celery at the college. The species is our most common one in the heads of clover and is found on onions and various weeds. The individual specimens are only about one eighth of an inch long, slender, and prettily marked with three white cross bands along the wings. They were found mostly on the tender central portion of the plants, often hid in considerable numbers between leaves, but as often scattered singly all over the plants. They no doubt assisted the leaf hoppers in making the celery look sickly, but they are so minute that they are not likely to do special harm unless very numerous. Should this occur, a spray of kerosene emulsion will diminish their numbers.

The method of preparing the kerosene emulsion may not be well known to all celery-growers, and so it will be given: To two quarts of water add one quart of soft soap or one fourth pound of hard soap, and heat the whole to boiling. When the soap is dissolved, take from the fire, add a pint of kerosene and agitate so thoroughly and rapidly with a force pump without the nozzle that the mixture will foam like milk when filling the dairyman's pail on a summer's evening. It should be churned in this way until the soap and oil become permanently mixed; that is, until the oil will not rise or appear on standing or when diluted. This will take at least three minutes' rapid work. Stirring with a stick or spoon or slow pumping will not emulsify the soap and oil, though an egg beater may be used for a very small quantity. The emulsion as first made is too strong and will injure the plants unless diluted before applying. The soft soap emulsion should have as much water added as there is emulsion, and the hard soap emulsion, twice its bulk of water added and well stirred. They are now ready to be applied with a spray pump. The dilute emulsion should be stirred frequently in applying.

The above is the regular formula. The emulsion can be made in larger quantities in the same proportion, but if made in quantities larger than six or eight times the regular formula, it will be difficult to make a stable emulsion with a small hand force pump. This has been one of the discouraging features in the use of kerosene emulsion. It now seems evident that we can overcome that difficulty in a large measure. The method is to use the soft soap formula, as given above, without the water. The soft soap is heated until it becomes liquid and then, without water, add half as much oil as there has been soap used, emulsifying according to the directions given as above. The emulsion made in this way is as perfect as when used with water and it is so concentrated that it is one third oil, or in other words, the same emulsion in this way occupies less than one half the space that it would when made by the first formula given. An emulsion made in this way, without water, will need to be diluted with four times its own bulk of water before using.

THE CELERY APHIS (*Rhopalosiphum dianthi*, Schr).

ORDER HEMIPTERA.

FAMILY APHIDÆ.

Nearly all plants are troubled with plant lice, or "green fly." On celery the above named species has been very common except from the latter part of July till the September rains came. Prof. T. A. Williams of the South Dakota station and Mr. F. A. Sirrene of the Iowa station pronounce it a very common species feeding on many plants. The dark, winged form has been the most conspicuous and so common at times that a dozen or more could be counted on single plants. The very young wingless ones were found early in the season and very late, but through the rest of the season neither young nor old were found. They probably breed on some other plant. Had they continued

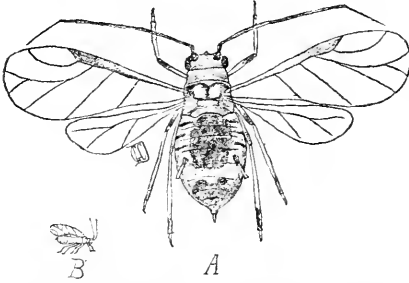


FIG. 11.—The celery aphid; enlarged and wings spread at A, side view and natural size at B—(original).

to breed in the field throughout the season as rapidly as they did in the breeding jar where confined, the plants would have suffered severely. As it is, they did little harm the present season. It would not be surprising if they should acquire a better liking for celery and in a few years should breed on it. As with the Thrip, kerosene emulsion becomes our "helper in the time of need."

THE CELERY APHALARIA (*Aphalaría calthea*, Linn).

ORDER HEMIPTERA.

FAMILY PSYLLIDÆ.

This is another insect very closely related to the celery Thrip and Aphis, that was on the plants in the spring along with these two species and about as common. Later in the season it was not found. It is about the size of the celery aphid and is of a yellowish brown color with a reddish tinge. The family to which it belongs is known as "jumping plant lice," because many of the species jump rather than fly. There are but few of the species known to be injurious, and it is not at all probable that this species will be a serious celery pest. If at any time it becomes so, the best remedy that can be suggested is the kerosene emulsion.

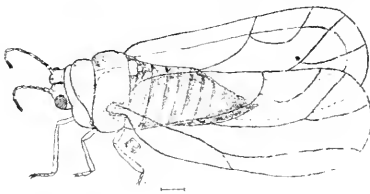


FIG. 12.—The Celery Aphalaría, enlarged as shown by the line beneath—(original).

## OTHER LESS COMMON BUGS.

Besides the species of true bugs already considered, there were several others found less common on celery which were either seen sucking the sap or else known as plant feeders. The most conspicuous one of these is a common stink bug, *Euchistus tristigmus*. It is a broad flat bug that seems to prefer a mixed diet, as it was not only found with its beak thrust

into the celery stalks but into some unfortunate larva that came in its way. The species is not common enough to do any great injury, but another darker and somewhat more slender species, closely related to the tarnished plant bug, may prove harmful. This species is known as the dusky plant bug, or *Derocoris* (*Calocoris*) *rapidus* Say. It was only occasionally found on celery this season. Two other species, *Agalliastes associatus* Uhl. and *Poeciloscytus basalis* (?) Reut. were also occasionally found. Remedies suggested for the tarnished plant bug will apply also to these species.

#### CELERY BEETLES.

In this order of insects, the beetles, with their hard shelled wing covers, the injurious species are very few. What there are belong to one tribe—the flea beetles. They are given this name because when disturbed they will leap and jump like fleas, instead of flying. The largest of these little beetles is not over a twelfth of an inch long. In feeding they are not like the bugs just treated of, but have biting mouth parts with jaws that chew the leaves. The work of the flea beetles is easily recognized by the numerous little round holes that will be found eaten in the plant on which they feed. We always find them the worst in the early part of the season when the plants are young and tender. On the celery

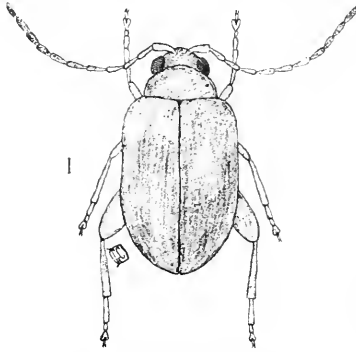


FIG. 13.—*Longitarsus melanurus*, one of the celery flea-beetles—(original).

there were three species, *Longitarsus melanurus* (Fig. 13), *Crepidodera cucumeris*, and *Chaetocnema parvipunctata* that were common in the order named. The second species named, along with the turnip flea beetle, *Phyllotreta vittata*, has often done much harm on our grounds to turnips, radishes, tomatoes, and cabbages, and no doubt their work is familiar to all. They have often skeletonized the leaves so that little but veins would be left, or, with the plants recently transplanted, have eaten them so that they have wilted and died. The work of the flea beetles on celery is the same as on other plants, and their work in spots last spring was considerable. If the beetles are at all numerous at transplanting or soon after, they will soon do the plants harm and the plants should be freed of them. To do this a very safe and sure means would be to use the hopperette spoken of under leaf hoppers on page 29. The beetles are very easily disturbed and leap so readily when it is warm that they are almost sure to be caught. Prof. Cook found a few years ago that a strong tobacco decoction worked admirably in keeping the little flea beetles off the plants. He used a double handful of tobacco dust to each gallon of boiling water.

#### THE CELERY CATERPILLAR (*Papilio asterias*, Fabr.).

ORDER LEPIDOPTERA.

FAMILY PAPILIONIDÆ.

We now come to the caterpillars that in the mature form become butterflies and moths. The first caterpillar of which we treat is one of the most conspicuous of all the celery insects. Its large size when nearly grown, and the striking color of yellow with black transverse bands, makes it on

the dark green background of the celery leaf an object that is readily seen. It has been known as a celery caterpillar for some time. Every year we receive specimens of the caterpillar with a great many queries regarding it; not particularly because it is so plentiful, but because it so quickly catches the attention and arouses the curiosity. The Y-shaped yellow horns, that it throws out when annoyed, have no sting and are harmless. They are scent organs that emit a very disagreeable odor as a protection against its enemies.

#### FROM CATERPILLAR TO BUTTERFLY.

Of course, this caterpillar first hatched from an egg that was laid on the celery plant. At first the caterpillar is small, but in only a few weeks it has grown to its full size. Then it attaches itself to the stem and in a few hours time the caterpillar will have become a chrysalis as seen at *d*, Plate II. This is the resting period, as it has little power to move and eats nothing; but on some bright sunny morning a fresh, new, black and yellow butterfly comes from this pupa case and spreads her gauzy wings ready for flight. The butterfly feeds only on the sweets from flowers and does the celery no harm, except that, after a few days of her career, she haunts the celery field and deposits her eggs there for another brood. The caterpillars are the most common through September, but are occasionally seen in July and August. They live through the winter in the chrysalis stage.

#### OTHER FOOD PLANTS.

Parsnip, carrot, and wild parsnip are fed upon by this caterpillar as readily as celery. Many other plants as caraway, parsley, sweet fennel, etc., belonging to the same family, also furnish it food.

#### NUMBERS REDUCED BY A PARASITE.

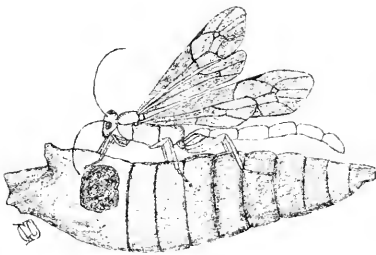


FIG. 14.—*Trogus exessorius* on the pupa case from which it has issued at the side. Twice natural size (original).

Whenever these caterpillars are present, wasp-like parasites with yellowish red bodies and black wings, may be seen darting through and around the plants in search of their host. The young of these parasites feed inside the caterpillars, and after the caterpillar has changed to a chrysalis, the parasite gnaws a hole in the case and comes forth instead of a butterfly. The parasite (*Trogus exessorius*) helps greatly to keep the number of caterpillars lessened.

#### REMEDIES.

As a usual thing the caterpillars will not be plentiful enough to need special attention. When so large and conspicuous, hand picking would be a ready remedy.

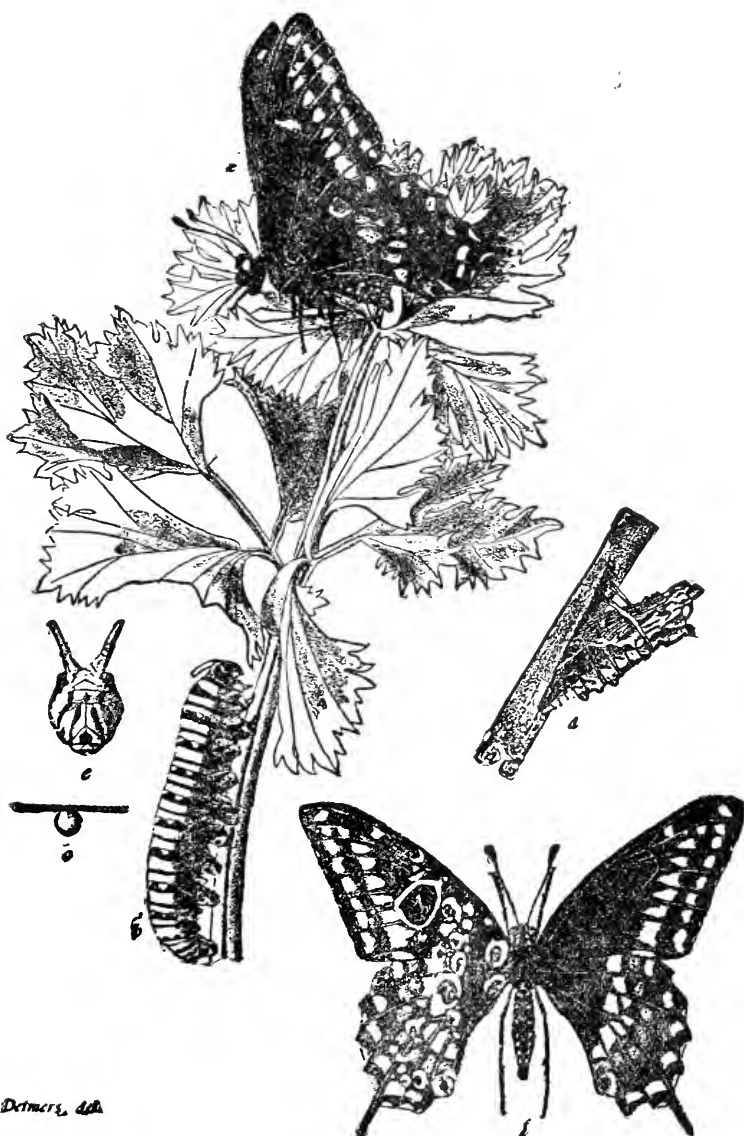


PLATE II.—Transformations of the celery caterpillar. *a*, egg; *b*, full grown caterpillar; *c*, front view of the head, showing the scent organs; *d*, chrysalis attached to a stem; *e*, butterfly at rest; *f*, butterfly with wings spread—(after Weed).

#### PARIS GREEN AS A REMEDY.

Our usual remedy for all caterpillars is Paris green or some of the arsenites, when they can be used without endangering the plant for food. Celery is a plant that will permit the poison to settle around the edible portion at the base and caution has been used in recommending the

arsenites. To test the possibility of poison being concealed between the stems, a row of plants was sprayed with Paris green at the rate of one pound to 175 gallons of water. Two weeks later a part of the same row was again sprayed with the same. The plants then stood another week when both lots were taken up, the roots, leaves, and green stems taken off, and the remainder washed under the hydrant without separating the stalks. The bunches were in this way prepared as they are for market. They were then sent to our chemist for analysis.

His report is as follows:

*Agricultural College, Mich., Oct. 12, 1893.*

DEAR SIR—The specimens of celery sprayed with Paris green have been analyzed by Mr. Harrison, and the quantity of arsenic ( $As_2O_3$ ) determined in a pound of celery.

He finds the following quantities of arsenic in grains in one pound:

No. 1, sprayed once .....	.0244 grains
No. 2, sprayed twice .....	.0368 “

Yours truly,

R. C. KEDZIE.

This amount, Dr. Kedzie tells me personally, would not poison anyone at once but the effect would be evident with frequent use. The poison was freely applied, much more thoroughly than it generally would be, that our information might be certain whether or no it might be recommended. From the above analysis we can hardly recommend the use of any of the arsenites to protect celery against insects and must resort to anti-poisonous remedies.

THE ZEBRA CATERPILLAR (*Mamestra picta*, Harris).

ORDER LEPIDOPTERA.

FAMILY NOCTUIDÆ.

A common zebra-like caterpillar that feeds on the leaves of celery. It is found occasionally early in the season but becomes more plentiful and often harmful later.

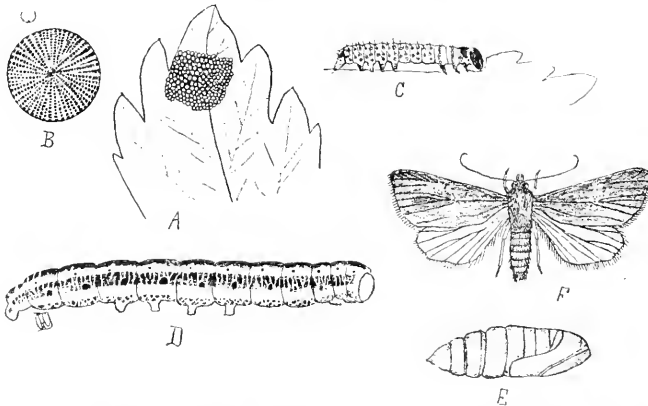


FIG. 15—*Mamestra picta* in its various stages. A, cluster of eggs as seen on a leaf; B, one of the eggs magnified; C, the young caterpillar; D, the mature caterpillar; E, the pupa; F, moth. All natural size except the single egg—(original).

Though not so large, this caterpillar is even prettier and more striking than the preceding species. For the seasons of 1891 and 1892, this was the most common celery pest reported to us. Last year it was very com-

mon on our own celery, but it was the late brood, and although it nearly stripped the leaves in some places, the work came so late that the celery was nearly ready for market and had completed its growth. Parasites so thinned the numbers of the caterpillar last fall and early this summer that this season only a few appeared. The caterpillars feed only on the leaves, remaining in a group while young, but soon separate and feed by themselves.

#### LIFE HISTORY.

The eggs (see A, Fig. 15) are placed by the moth in a little group on the under side of the outer leaves, often near one edge. She is very prolific, laying in a compact bunch usually from 125 to 150 eggs, but in one instance this season a cluster of 452 eggs was counted. In from two to three weeks the eggs hatch into little hairy, speckled, white caterpillars with a black head and black crescent on the thorax. While in this condition they feed in a group and will suspend themselves by a web when disturbed. Their life in this attire lasts only two or three days when they don a bright new coat entirely different from the former one. The covering now is of much the same color that it is in the mature form. The head and legs are a reddish yellow and the rest of the body black except the two stripes, one bluish white and the other light yellow, connected by irregular cross lines. The caterpillars pass through several more moults as they grow. At maturity they measure nearly two inches in length. They then go into the ground where they pupate and after they remain in this resting stage for a short time, appear as moths.

There are two broods each year, the first one coming in June and July and the second appearing in September. This last brood is hardly half grown when it leaves the celery for winter quarters in some protected place and comes forth early in the spring to complete its growth.

#### PARASITES.

The second brood last fall were largely parasitized by a small four-winged fly (*Microplitis mamestræ* Weed), bred from the zebra caterpillar and described several years ago by Dr. Weed. We have no access to his papers on this parasite, but perhaps a few notes from what was observed by myself will show the method of its work to those not familiar with the ways of parasites. By the time the caterpillar is nearly half grown the parasite inside the caterpillar is full grown. It then issues from the side of the caterpillar only a short distance in front of the last pair of legs. When only part way out it begins spinning its silky threads and attaching them firmly to the caterpillar around it. From this foundation it weaves out by looping the web outward nearly an eighth of an inch and fastening each time as it is brought back. After a little basket is formed in this way on one side, the parasite issues entirely and enters the web sack it has made. The next thing is to stretch and shape the sack, strengthening it all the while in the weak places. Then begins the gradual closing of the embryo cocoon around the parasite, finishing last on one side next the caterpillar, but before entirely enclosed it fastens webs that draw it tight to the side or else under the caterpillar. The work so far has taken the parasite about three quarters of an hour. The rest of the work is a series of weaving, turning, pushing, and shaping till it has made the web so thick in two or three hours that it can no longer be seen. The cocoon is about one

fourth of an inch long. The caterpillar remains inactive after the parasite escapes and in a few days dies because of the internal injury done by the parasite. Safe in its tightly woven cocoon, the parasite remains till the following spring when it comes forth as a winged fly to attack other caterpillars.

This season none of the *Microplitis* have been seen, but another parasite has been even more destructive to the *Mamestra*. These parasites are so minute they can hardly be seen with the naked eye, being three fourths of a millimeter, or one thirty-fifth of an inch long. They do not attack the caterpillar but mature inside the eggs of the *Mamestra* and destroy them before they hatch. From two thirds to three fourths of most of the bunches were destroyed in this way. The parasitized eggs change to a dull lead color in a few days. Mr. Ashmead writes me that he has bred the same species from the cotton boll worm (*Heliothus armigera*) of the south and has given them the name *Telenomus heliothidis*.

In addition to these two parasites on *Mamestra picta*, two predaceous species were seen doing their share in destroying the eggs. One of these is a lady bird beetle (*Megilla maculata*), and the other is the tarnished plant bug (*Lygus terciois*) previously treated of as a celery pest. Our celery pest in this case becomes a destroyer of another pest by inserting the lance of its beak into the eggs and sucking the contents. The lady bird beetle eats shell and all, but the bug leaves the shell entire though usually it is split where the lance enters. Seeing every once in a while quite a number of the egg cases empty and split open in this peculiar manner, I was led to watch for the cause of it. I soon found a tarnished plant bug at work on a cluster of eggs and watched it for some time. The eggs seemed to be greatly relished by the bug as it would repeatedly return when driven away and begin feeding at once. With so many vigilant foes to overcome, the zebra caterpillar will have difficulty in reaching maturity.

#### FOOD PLANTS.

The caterpillars of this species are very general feeders and are especially fond of most garden crops. They sometimes become plentiful enough to be injurious. Dr. Harris, in his "Insects Injurious to Vegetation," p. 451-2, gives us one of the earliest accounts of its destructive work. He mentions it as injurious to cabbages, cauliflowers, spinach, and beets.

Dr. Riley in his 2d Mo. Report, p. 112 (Ill.), after giving habits and history, mentions, besides many weeds and flowers, asparagus in addition to those given by Harris.

In the 6th Ill. Report, p. 60, Thomas reports it being very partial to the leaves of the pea.

In the 5th Ent. Report of N. Y., p. 206-10 (Ill.), Dr. Lintner gives a very complete article on the species and adds currants and buckwheat to the list of food plants.

Here at our college we found them common on two species of clover, alsike and alfalfa.

#### REMEDIES.

When a cluster of eggs is found on a celery leaf or the very young larvæ are seen, they can be very easily crushed. With the older ones Dr. Lintner has found that pyrethrum powder mixed with five parts of flour and dusted.

over the caterpillars was a very satisfactory and speedy remedy. The powder can be bought already prepared at the stores. Care should be used, though, to see that the dealer obtains it fresh from the factory, as the powder loses its strength upon standing any great length of time. The powder is made from the blossoms of a plant similar to the chrysanthemum and is perfectly harmless to man and all animals breathing with lungs.

### THE SPOTTED CUT-WORM (*Agrotis C-nigrum*, Linn.).

ORDER LEPIDOPTERA.

FAMILY NOCTUIDÆ.

A fat, light colored caterpillar with dusky spots taken on the stalks of blanching celery. It is usually known as the corn cut-worm, because so often found injuring corn in hills.

A single specimen of this cut-worm was taken July 28, feeding on the stalks of a celery plant after it was boarded for blanching. The cut-worm pupated August 9, about half an inch below the surface of the ground and appeared as a moth September 5. This was the only cut-worm found, although quite a number of the moths were seen early in September, and also moths of *Hadenia sputatrix* were quite plentiful in the various fields and probably this species feeds on celery also.

The *c-nigrum* is usually known best as a corn cut-worm. It is also known to destroy cabbages and other garden plants. In 1890 it was reared here on the currant by Prof. Cook from eggs found June 26. There are two broods each year, the last one remaining over winter in the grub state. There need be little fear of either of these cut worms becoming plentiful enough to injure the crop seriously so long as the soil is kept constantly stirred, as it is, from early spring to late fall. Should they become numerous, their work on the stalks may prove quite serious and in such a case bait traps of little bundles of clover poisoned with Paris green and distributed through the field, will be found helpful.

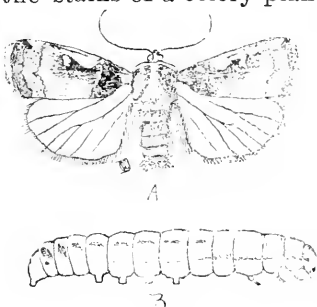


Fig. 16—The spotted cut-worm B, and moth A; both natural size—(original).

### THE CELERY PLUSIA (*Plusia simplex*, Guen.).

ORDER LEPIDOPTERA.

FAMILY NOCTUIDÆ.

Feeding on celery, lettuce and a few other plants; a naked, green, span worm, whose body is marked with eight white lines, and is provided with only twelve legs.—*Coquillett*.

A single specimen was taken in the pupa stage, wrapped in a white silken cocoon, and this rolled up in what was left of a leaf it had nearly eaten. The moth appeared on the 14th of July.

In the 11th Ill. Ent. Report (1882) p. 38, Mr. Coquillett reports this *Plusia* as destructive to celery in many gardens in the locality of Germantown, Ill. It is very closely related to the cabbage *Plusia* that becomes destructive at times and then apparently disappears for years before again attacking the cabbages in numbers. The habits of the celery *Plusia* are probably much the same. In the absence of a drawing, a few words from Mr. Coquillett's description may enable growers to identify the caterpillar. The body is very robust posteriorly, from whence it tapers to the head. It is a pale green, with a dark line on the back, and on each side three white lines, the middle one longest. Below and above the white stigmal line the body is dark green. The white spiracles are ringed with

black. The head is green with black eyelets. Length one and one fourth inches when full grown. The moth is slightly smaller than that of the spotted cut worm (Fig. 16) and is marked with light gray and dark brown with a silvered hook extending into the center of the front wings. Three broods each season are reported in Illinois by Mr. Coquillett.

#### REMEDIES.

The only remedy suggested is cold water. In his rearing experiments with the larvæ, Mr. Coquillett found the leaves when wet produced a disease of violent scouring that soon killed the caterpillars. The specimen reared by myself seems to be an exception to the rule as the weather was exceptionally wet up to nearly the time of the appearance of the moth. Perhaps it was owing to confinement that the water produced such an effect. Should this not prove sufficient, the pyrethrum powder spoken of under the zebra caterpillar no doubt will be effectual.

#### THE CELERY BORER (*Phlyctenia ferrugalis*, Hbn.).

##### ORDER LEPIDOPTERA.

##### FAMILY PYRAUSTIDÆ.

Greenish translucent caterpillars, about one inch long, that were taken both boring in the stems and feeding on the leaves.

The habits of this species seem quite variable. It both bores in the stems and feeds on the leaves. While at Kalamazoo the 26th of August

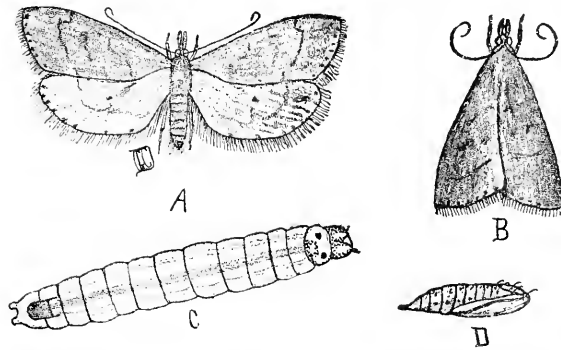


FIG. 17.—The celery borer. A, moth with the wings spread; B, same with the wings folded and at rest; C, top view of the full grown caterpillar; D, the pupa. Twice natural size—(original).

one of these caterpillars was found burrowing on the inside of the celery stalks close to the base. The crown had been eaten out and the plant nearly eaten up. The outer leaf stalks were channeled at the base and nothing left except the shell on the outer side. An immense amount of frass was left for so small a feeder. No other plants near this one seemed to have been molested. On the same day in other fields

larvæ that appeared to be the same were taken quite plentifully either rolled up or sewed in between celery leaves. These caterpillars fed on the leaves around them and did not molest the stems. Both lots were placed in separate breeding jars, but from this on, all acted and fed alike. On the 28th the most of them webbed up between the leaves, or cut chunks of leaves out and pasted them to the jars. Others webbed up a day or two later. The first moths appeared the 14th of September. The borer appeared the next day and proved to be the same species as the others.

#### REFERENCES.

For the identification of this and the following species of small moths and references to them, I am indebted to Prof. C. H. Fernald, our well-known authority on the Micro-lepidoptera. He writes me that to his knowledge the species has never been bred in this country before. In an

English periodical (*Entomologist's Monthly Magazine*, Vol. XIV, pp. 200-204) we find all the early stages fully described. This species was bred on the leaves of boneset (*Eupatorium*), and was also taken on hedge nettle (*Stachys*) and strawberry leaves. It is thought to be two or more brooded.

## DESCRIPTION.

The full grown larva is nearly an inch in length. Head and thoracic shield drab, with black markings as shown in the drawing. Along the body is a dark green dorsal line on each side of which is a very faint almost obscure opaque white line merging off to a translucent greenish and bordered by another opaque white line. On the sides is a very obscure yellowish green line. There is a distinct caudal shield of white and dark green. The caterpillar is sparsely covered with hairs.

The moth is reddish brown on the front wings and a grayish brown on the hind wings. Both have the faint black markings shown in the drawing.

## REMEDY.

It is probable that the usual habit of this caterpillar is to draw the leaves together and feed on the leaves rather than bore in the stem. When feeding on the leaves alone it does much less harm. At present the species is not plentiful enough to cause any immediate alarm. Were the life history of the species better known, it is probable that some good means of control could be found.

THE SULPHUR COLORED TORTRIX (*Dichelia sulfureana*, Clem).

ORDER, LEPIDOPTERA.

FAMILY, TORTRICIDÆ.

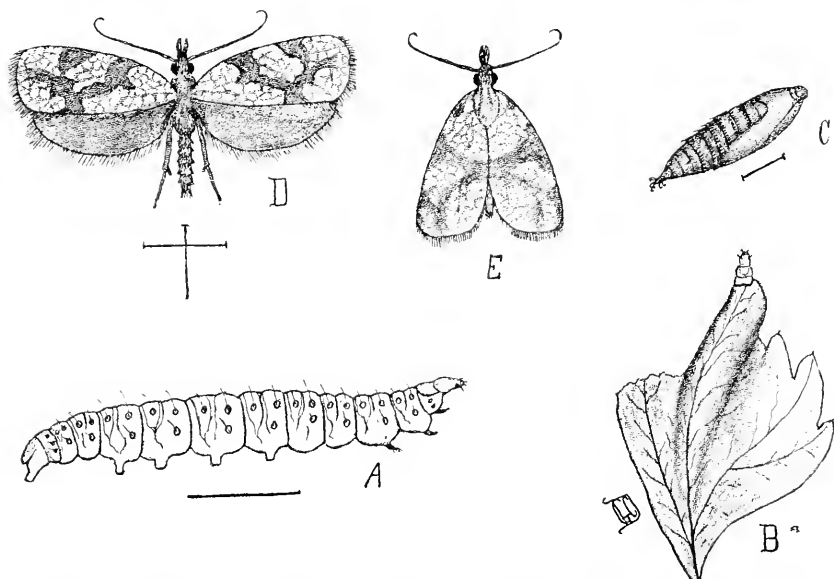


FIG. 18.—The sulphur colored tortrix. A, full grown caterpillar; B, the same as seen rolled in a leaf; C, the pupa; D, the moth with wings spread; E, same with wings closed and showing variation in color markings. The hair lines show natural size—(original).

This was the most common celery leaf roller found this season. It was found more or less common in every locality visited. There are at least two broods and probably three. Of the first brood noticed the larvæ became full grown about the first of August and pupated early in the month, remaining from five to nine days in this state before issuing as moths. The next brood reached maturity the latter part of September and probably remain over winter as pupæ. Previous to this the species has been bred on clover and common buttercup (*Ranunculus acris*).

The larvæ are light green all except the tips of the mandibles (jaws), labrum (upper lip), and front feet which are black, and the head and thorax which are lighter—almost a flesh color. They live in leaves drawn together around them by a web which they spin, and feed on the adjoining leaves. They pupate in the same leaves in which they live. The little moths are a bright sulphur yellow with a network of small red lines and larger reddish brown bands on the primary wings. The hind wings are dusky. The band on the front wings varies considerably, the two extremes of the specimens reared being shown in the figure.

Should the species become still more common, and perceptibly reduce the foliage of the celery, it is probable that a great deal can be done to prevent the attack by cleaning up all leaves and refuse material left in the field in the fall and burning it. From our present knowledge, it would seem that this would destroy many winter pupæ.

#### THE CELERY TORTRIX (*Sericoris bipartitana*, Clem).

Only occasional specimens of this species were found. The larvæ feed on the leaves and live in a gallery made by drawing several leaves together.

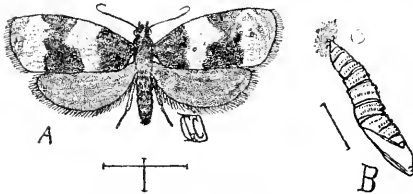


Fig. 19—The celery tortrix three times the natural size. A, moth; B, pupa—(original).

They are half a inch long, or a little more, quite slender and very active, throwing themselves with great violence when taken from the case. They are a dark greasy brown (almost black) with black shield on thorax, legs and plate on terminal segment black, prolegs and under side lighter.

There are four shining dots above on each segment forming a square. On the sides are pits, one to each segment, and a dot above and below. The body is sparsely covered with hairs. They pupated early in August and appeared as a moth two weeks later. The moth is black and white with dark posterior wings and light abdomen. Prof. Fernald says the species has never been bred before to his knowledge.

## OTHER CATERPILLARS ON CELERY.

One of our common leaf rollers and one that we might expect to find on celery, as it is such a general feeder, is the oblique banded leaf roller (*Cacæcia rosaceana* Harr.). The pale green caterpillar is one of our largest, plumpest leaf rollers.

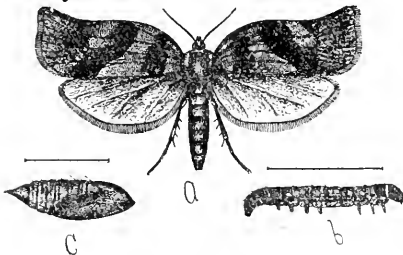


Fig. 20—The oblique banded leaf roller, *Cacæcia rosaceana*, a, moth; b, caterpillar; c, pupa.—(after C. F. Baker).

Very similar in shape but of a uniform buff color is another moth (*Tortrix pallorana* Rob.) that was bred on the leaves of celery, August 17. It is a leaf roller with habits similar to the others, and is also quite a general feeder. Only one specimen of each of the above species was reared. Another caterpillar that destroyed at least two rather small

plants by eating stems and leaves was the large hairy red and black one (*Pyrrharcia isabella* S. & A.) that is so common everywhere in the autumn. It is probable that this one specimen was rather partial to celery as others of the same species were found around celery that did not seem to feed on it at all. In confinement they eat it readily.

There were several other caterpillars (at least four species) that were taken feeding on celery but they did not reach maturity. One of these was a dark, dingy specimen, about half an inch long, that bored in the hearts of very young plants. It possibly was a cut-worm but looked more like the larva of a butterfly. Only the one was found and by an accident it escaped from confinement before reaching maturity. Another partly grown specimen was determined at Washington, D. C., as probably *Leucarcetia acrea*.

“RED SPIDER” (*Tetranychus telarius*, Linn).

ORDER ACARINA.

FAMILY TROMBIDIDÆ.

Our common little greenhouse mite, commonly known as “red spider,” has taken a liking to celery this season and enrolls itself along with the celery insects. The latter part of the season was extremely dry, and favorable for its increase and, before the drought was broken, little blotches made by the mite began to appear in places quite thickly over the under side of the leaves. By raising the leaf the yellowish mites about the size of a pin head, will be seen through a slight web in which they live. They thrive only in a dry, hot atmosphere, and plenty of water is equivalent to poison for them.

Quite a number of other insects of various orders were collected on celery and although suspicion brands many of them as celery insects, they are not mentioned, as they were seen neither feeding nor breeding on the plant. Being in the fields only at intervals has interfered somewhat with extended observations that are so essential to the best work. Enough has probably been given to show the number of insects the celery-grower must compete with in raising his crop.

## CELERY LEAF BLIGHT.

As the leaf blight is dwarfing and injuring celery so much in many localities and spreading to others, it was thought best to investigate this disease and give it a portion of our consideration along with the celery insects. In many places over the state the leaf blight is not known. In fields where celery has been grown on the same ground for a series of years, the blight through the hottest part of the season is severe. It is very generally known among celery-growers in these places as "sun blight" and is supposed to be produced by the hot sun. One season, several years ago, it took nearly the whole celery crop at Kalamazoo. The blight has troubled the fields in the northern peninsula for the past three years, as Mr. Wheeler, our station botanist, learns through correspondence. The same letter says, "'White Plume' and 'Golden Self Bleaching' suffered more than other varieties. 'Henderson's New Rose' has been entirely free from blight."

The blight is caused by a fungous disease working inside the celery leaves. No experimental work has been done on it here. Dr. B. T. Galloway has experimented on the blight in eastern fields and he kindly sends his unpublished notes for our use. The following are his notes in full:

## CELERY LEAF BLIGHT, AS AFFECTED BY WATER SUPPLY TO THE PLANT.

Celery leaf blight, caused by *Cercospora apii*, is an exceedingly destructive disease, especially in the eastern part of the United States. For several years we have been making experiments in the hope that some means of cheaply preventing the trouble might be discovered. In 1890, 1891, and 1892 a number of trials made were with various fungicides, including both liquids and powders, but none of these gave very satisfactory results. In every case where the celery was planted on upland soil it blighted badly, despite the fact that the leaves were kept nearly covered with such well-known fungicides as Bordeaux mixture, ammoniacal solution of copper carbonate, etc. Where these preparations were used, however, the celery was not so badly attacked by leaf blight as the plants receiving no treatment at all.

Noticing that celery on low, moist ground was seldom severely injured by blight, an experiment was made in 1892 on upland soil to test the effect on the disease of water applied to the roots. The plants selected for the experiment were fully exposed to the sun and were set in such a way that they could be flooded sufficiently often to keep the ground always soaked. Without any further treatment these plants made a vigorous growth and were almost wholly free from blight. The average height of the plants when bleached was thirty-two inches. Plants in the same bed which received only water falling naturally, as rain, blighted very badly, in consequence of which there was not enough leaves to bleach when the time came for this operation. In height these plants averaged a little over eight inches, or about one fourth that of the watered celery. The experiment shows the importance of an abundant water supply for this crop and explains in a measure why in certain localities celery is seldom affected with the disease. Of course it may not be practicable for all upland celery-growers to water as extensively as seems necessary to keep the crop growing and free from disease, still there are no doubt many places where irrigation could be practiced at comparatively little expense, making the crop, even in regions where the soil and climate is naturally unfavorable, a certain and profitable one.

G. C. DAVIS.

## VARIETY TESTS OF VEGETABLES.

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BY L. R. TAFT.

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Bulletin No. 109.—Horticultural Department.

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For several years it has been the custom of this department to make careful tests of the varieties of vegetables sent out by the different dealers as novelties, and to issue the results in bulletin form at the end of the season. Many of these so-called new sorts are sold at prices much above those of standard varieties, but although highly praised by the introducers, are not always worthy. On the other hand, they are often greatly improved strains of some of the old and valuable sorts or new and distinct varieties of marked merit, and would then be desirable acquisitions.

The purchaser can only determine their value by actual trial, and for any one person to purchase and grow all the highly praised varieties sent out in a single season will require a large expense in money and time. The experiment station can do this work and the reports of the results of the trials will be of value to every one who purchases garden seeds. It must be admitted, however, that in many cases we are one year behind the time, but the grower will have the report for use the next year and by that time the cost will be reduced so that a start can be obtained with a smaller outlay. It is desirable, and the seedsmen are each year doing it more and more, that promising novelties be submitted for trial, to some half dozen experiment stations in different parts of the country, who make a specialty of testing varieties, the year before they are catalogued. Before a seedsmen takes up a novelty he generally tests it for at least one season upon his own trial grounds, and if, when he obtains a sample of a variety which he proposes to introduce should it upon trial prove desirable, he would send a sufficient amount to some of the experiment stations, or require the originator to do so, not only might it save the public from loss should it be inferior, but, if it has real merit, a report to that effect by the stations

would both increase the sales of the dealer and assure the public that the variety has value.

In the course of our variety tests we have had frequent occasion to ascertain the character of the seeds sold by different dealers, both as to vitality and the value of the strains, and we believe that most of them are doing what they can to keep their seeds up to a high standard. We find that as a rule far better results are obtained when the seeds are ordered direct from the dealers, rather than purchased as box or bulk seeds of a grocer; but, however reliable a seedsman may be, it will always be found safest to test the vitality of the seeds before putting in the crop. Seeds of low germinating power are occasionally sent out by all dealers, unwittingly oftentimes, and a few minutes spent in testing the seeds may save one from serious pecuniary, as well as a vexatious, loss.

The tests of the cabbages, cauliflower, sweet corn, and peas have been under the charge of my assistant, Mr. R. J. Coryell, and the report was prepared by him, while Mr. H. P. Gladden has looked after the beans, celery, cucumbers, lettuce, salsify, squashes, and tomatoes, and has prepared the appended notes. Quite a variety of other vegetables were grown, but in very few of them were there any novelties that have been found better than the old sorts.

The seeds used in the tests were obtained from the following firms: Robert Buist, Jr., Philadelphia, Pa.; Atlee Burpee & Co., Philadelphia, Pa.; Currie Bros., Milwaukee, Wis.; D. M. Ferry & Co., Detroit, Mich.; J. J. H. Gregory, Marblehead, Mass.; Peter Henderson & Co., New York; D. Landreth & Sons, Philadelphia, Pa.; A. W. Livingston's Sons, Columbus, Ohio; W. H. Maule & Co., Philadelphia, Pa.; A. M. Nichol, Granville, Ohio; W. W. Rawson, Boston, Mass.; John A. Salzer, La Crosse, Wis.; J. M. Thorburn & Co., New York City, and J. C. Vaughan, Chicago, Ill.

## CABBAGE.

R. J. CORYELL.

The forty-eight varieties tested this year included nearly all of the new sorts listed by the seedsmen, and some of the standard kinds for comparison. The seeds were sown in the forcing house on March 20. The plants were transplanted into flats on April 8 and set in the field May 16.

The severity of the drought, which extended from July 16 to well into September, was so great that the test was a failure in that many kinds headed out of season. The test was of value since it showed clearly those kinds that would produce a good crop under adverse conditions. The earliest varieties were not affected, the injury being most severe on those that mature at midseason or later. Of these the larger kinds, or those that have many leaves, suffered most. The medium-size varieties that had but few outside leaves were generally uniform in heading and produced a fair crop.

Of the early varieties the *Etampes*, Currie, and *Lightning*, Salzer, were the first to head. The latter, a strain of the Wakefield, produced very even, solid heads. The *Charleston Wakefield*, Henderson, was a day or so later and enough larger to make up the difference in time. *Eclipse*, Currie, advertised as a second-early variety, matured with the *Charleston*

*Wakefield*. The type did not appear to be fixed, but a good crop was produced. Following these kinds within a week are several larger varieties. *Henderson's Early Summer*, Ferry, proved to be an excellent strain of that well-known sort. *Ideal*, Salzer, was much like it and as good. *Bloomsdale Early Market*, Landreth, and *Early Flat Dutch*, Ferry, were of the same season as the preceding kinds, but not so good.

Of the mid-season sorts, *All Seasons*, Ferry, followed closely the second-early kinds. Every plant produced a salable head. It is a strain of the *Flat Dutch* and will be found a reliable variety.

*Succession*, Ferry, was four days later than *All Seasons* and much like it, maturing in eighty-six days from the time of setting in the field. It was the best variety of this class and in fact the best of any planted this year. The heads were of medium size, solid, and uniform. The stump was short and leaves few. *Reynolds*, Maule, and *Fottler's Early Drumhead*, Ferry, were a few days later than *Succession*. They produced uniformly good heads.

All the late cabbages did poorly. *Autumn King*, Henderson, and *World Beater*, Burpee, are similar in growth and appearance. *Safe Crop*, Burpee, did fairly well. *Large Late Mountain*, Landreth, resembles the preceding variety closely. Fewer plants headed, but those that did were much better.

#### CAULIFLOWER.

Eleven varieties were tried. They were treated nearly the same as the cabbages, being planted and cultivated on the same dates, but were given richer soil. The drought affected them as it did the cabbages, causing a failure of the later maturing varieties.

Of the earlier varieties, the *Snowball*, Ferry, *Dwarf Erfurt*, Ferry, and *Sea Foam*, Rawson, were the best in the order named.

*Mont Blanc*, Buist, made a good showing. The head is well protected by leaves, which is an advantage to it. *Autumn Giant*, Vaughan, was much like this variety but it did not do as well.

#### SWEET CORN.

Each variety of sweet corn occupied a row 100 feet long, except in a few cases where the amount of seed was too limited. The rows were four feet apart and the hills in the row were put at a greater or less distance according to its growth. The planting was done on May 25. Five kernels were placed in a hill and afterward thinned to four stalks. Many kernels did not germinate and the varieties did not average more than three stalks per hill. All varieties grew well until the hot winds and drought came during the first part of August, which affected all except the earliest varieties. The frost injured a few of the later kinds.

TABLE NO. 1.—VARIETY TEST OF SWEET CORN.

Variety.	Seedsman.	Distance between hills as planted.	Distance between hills recommended.	No. days to market maturity.	Height of stalks in feet.	No. of stalks.	Av. No. of ears per stalk.	Av. weight of ears in ounces.	Av. length of ears in inches.	No. rows of kernels.	Yield per Acre.	
											No. pounds per acre.	No. ears per acre.
Cory.....	Ferry.....	2½	2½	67	3	105	1.11	5.3	5	8	6,500	18,000
White Cob Cory.....	".....	2½	2½	67	3	102	1.12	6.2	5	8	7,500	18,000
Eastman Early.....	Hicks.....	2½	2½	70	3	33	1.15	5.6	5	8	7,500	18,000
First of All.....	Maule.....	2½	2½	70	3½	96	1.27	5.6	5	8	7,500	18,000
Early Maine.....	Vaughan.....	2½	2½	71	3½	121	.75	5	6	8	4,000	18,000
La Crosse.....	Salzer.....	2½	2½	71	3¼	119	1.14	5.6	7	8	7,500	18,000
Ex. Ey. Vermont.....	Hicks.....	2½	2½	72	2¾	68	1.42	7.1	6	8	11,000	18,000
Northern Pedigree.....	Ferry.....	3	2½	73	3	49	1.24	5.2	5	8	5,500	18,000
Chicago Market.....	Buist.....	3	3	74	5	68	1.22	7.1	6	12	7,500	18,000
Perry Hybrid.....	Ferry.....	3	3	74	5	73	.97	8.3	7	12	7,500	18,000
Leets Early.....	".....	3	3	76	4	77	.81	7	7	12	5,000	18,000
Crosby.....	".....	2½	3	76	4	85	.96	6.3	5	10	7,500	18,000
Early Champion.....	Vaughan.....	2½	3	76	4	114	.91	6.7	5	12	7,500	18,000
Early Minnesota.....	Ferry.....	3	3	78	5	93	.86	6.1	6	12	5,000	18,000
New Eclipse.....	Hicks.....	2½	2½	78	2½	21	1.19	4.8	5	8	6,500	18,000
Concord.....	Ferry.....	3½	3½	79	5½	98	.58	7.6	5	14	5,000	18,000
Perkins Early Market.....	Buist.....	2½	3½	81	5½	127	.79	9.8	8	8	8,500	18,000
Golden Nugget.....	Gregory.....	4	3½	82	4	44	1.25	7.6	6	10	7,500	18,000

Pee and Kay	Ferry	3	3	88	4½	82	.76	6	12	
Mexican	"	3½	3½	88	4	21	.90	7.5	8	
Stabler Early	Buist	3	3	85	3½	37	1.19	13	12	
Hickox Hybrid	Ferry	3½	3½	85	5½	73	1.26	7.3	8	
Nonesuch	Maule	3	4	86	6	68	.87	9.8	10	
Egyptian	Ferry	4	4	88	6½	70	1.44	9	14	
Ne Plus Ultra	Buist	3½	3½	90	4½	44	1.78	8.1	12	
Stowell Evergreen	Ferry	4	4	90	5¾	55	1.02	12	16	
Squantum	Henderson	4	3½	91	5¾	77	.78	7.3	10	
Stabler Pedigree	Buist	3	3½	95	6	51	.96	9.3	10	
Old Colony	Ferry	3	3½	95	5	84	.52	8.2	16	
Gold Coin	Vaughan	4	3½	96	5	41	1.27	9.6	14	
Triumph	Buist	4	3½	96	4	98	1.16	10	8	
Zigzag	Northrup, B. & G. Co.	2½	4	96	6¾	105	.69	8	12	
Country Gentleman	Henderson	4	4	102	6¾	52	1.35	8.1	14	

When the ears had reached the edible stage, all except those upon four or five hills were gathered, counted, and weighed. Those that remained were allowed to mature and were then counted and their weight estimated to be the same as the others. This formed the data for determining the yield as shown in the table. In computing the yield per acre, four stalks were reckoned per hill, which was not the actual case, but it gave a fairer estimate of the value of that variety than had the actual number of stalks been used.

The distance apart that each variety should be planted was carefully studied and the one recommended as well as the distance actually used this year is given in the table. This point may be of value to some in making the most economical use of their land when sweet corn is grown in large quantities. Many varieties would do better by being planted less than four feet apart in rows and at a greater distance between the hills than is recommended in the table.

The following are new varieties:

*Eastman Early*.—D. C. Hicks, North Clarendon, Vt. A variety similar in growth and in ear to the *Cory*. The ears are not quite so regular nor as even in size as that variety and the kernels are more wrinkled than any of the early varieties, while the cob is variable in color from white to pink.

*Extra Early Vermont*.—Hicks. This is the most prolific variety among the early kinds. While excelled by the *Cory* and *White Cob Cory* in earliness, its productiveness makes it valuable. It set at least two ears per stalk and matured this year with us an average of one and one half ears. The type is not yet fixed, the cobs varying from white to red; ears slim, of fair length, and well filled.

*Early Champion*.—Vaughan. This variety follows the first-early kinds within ten days. The ears were of good diameter, but were very short this year, while the plants lacked productiveness.

*New Eclipse*.—Hicks. An eight-rowed variety having the same characteristics as the *Cory*, but maturing later. While setting a sufficient number of ears, they were very small and poorly filled.

*Zigzag*.—Northrup, Braslan & Goodwin Co. This is a late variety covering a long season. There is little or no difference between it and *Country Gentleman*.

The following varieties are recommended:

#### EARLY.

*White Cob Cory*, *Extra Early Vermont*, *Chicago Market* and *Stabler Early*.

#### MIDSEASON.

*Egyptian* and *Nonesuch*.

#### LATE.

*Gold Coin* and *Country Gentleman*.

## PEAS.

Fifty-six varieties were tested. These included most of the new varieties and many standard sorts. Considerable attention was paid to classifying the varieties. Those that were known to be of the same season and the same manner of growth were planted close together for convenience in comparison.

On May 10 the seeds were sown, two hundred seeds of each variety being planted in double rows ten feet long. After the vines were well up, all but one hundred were removed and the remaining vines were supported by a woven wire trellis. The season was favorable for a good test, although the hot weather hastened the maturity of the late varieties.

When the pods were in an edible condition, they were picked and the data for the last three columns of the table were obtained from them.

Among the smooth, white, early varieties there is but little choice. The *Bergen Fleetwing* was the most prolific, but the pods were small. *Maud S* and *Extra Early* had the best filled pods. In earliness, there appeared to be no choice.

Following these varieties very closely are several blue peas. Although edible in from forty-nine to fifty-one days, they were about four days behind the first-early kinds in market maturity and in ripening.

Between the *Alaska*, *Clipper*, and *Lightning* there appeared to be no difference. Of these the table shows the *Clipper* to be the best, although, as they grew, no choice was noted. Of these second-early peas the *Blue Beauty* easily stands at the head. It is a dwarf, stocky grower, productive of medium-size well-filled pods. *Universal*, a new variety of dwarf habit, is fairly promising. The pods are small and rather variable. *Chelsea* differs from the *Premium Gem* in the color of the peas and slightly in the appearance of the leaves. *McLean's Little Gem* belongs in this season. The pods are of good size and the peas are of good quality. It is well known and planted everywhere. *Kentish Invicta* is a very prolific variety, but its pods ran very small at the last. *Wm. Hurst* withstood the hot weather well. The pods were crisp and the peas were very sweet, but the vine was unproductive.

*Exonian*, a new kind imported into this country, is a day or so later than the above varieties. It is fairly promising, but did not withstand the heat as did the native sorts. *Early May*, a new variety, was said to be as early as the *American Wonder*, but it was much later. The pods are mostly borne profusely in pairs, and all reach maturity nearly at the same time. It fills the season very nicely between the second-early and the mid-season kinds. *Petit Pois* is a new variety introduced from France as of the highest quality. The vines are slim, medium tall, and very productive of rather small but closely filled pods. The peas are very delicious until full grown, when they rapidly harden. *Profusion* is a good variety for this season; its pods ran rather small at the last picking.

Following these varieties come those that are known as the mid-season kinds, most of which have larger pods than those preceding. Among these varieties there are a large number that are so nearly alike in growth, pod, and season, that if a grower had one of them he would not need any of the others.

Belonging in one class are the *Stratagem*, *Juno*, *Stanley*, *Shropshire*

*Hero*, *Pride of the Market*, *Gladiator*, and *Heroine*. These have strong, stocky vines about two and one half feet high, and bear medium large, thick, well-filled pods that are slightly recurved. The pods are borne near the extremity of the vines and reach maturity nearly at the same time. Also covering the same season are the *Abundance*, *Bliss Everbearing*, *Blue Imperial*, and *Yorkshire Hero*. These varieties have smaller, broader, flatter, and more pointed pods than the *Stratagem* class. These differ from each other in season slightly. The *Yorkshire Hero* is a little later and the *Blue Imperial* is slightly earlier than the *Bliss Everbearing*.

The *Telegraph*, *Long Island Mammoth*, and *Evolution* are varieties of medium tall, slim growth that cover a longer season than the preceding mid-season varieties. Their season begins with the *Stratagem* class and extends several days later. This is especially true of the *Long Island Mammoth*, from which edible peas could be picked for a period of eighteen days. *Fill Basket* resembles these varieties in the shape of its pods, but the vines are shorter and more stocky. It covers a long season and was the most productive variety of the mid-season sorts.

The *Duke of Albany* and *American Champion* are alike in every respect. Vines are tall and pods large. The pods of the former were not always well filled. They cover the same season as the *Evolution* class.

*Eugenie*, a new dwarf variety that follows the *Stratagem* class in a few days, is very productive. Pods medium large, well filled. *Dwarf Telephone* is a short, stocky variety with large, long pods like those of the *Telephone*, but it is more productive. In season it is about two days later than that variety. *Sutton Satisfaction* is a new late variety, very branching and very prolific if planted thinly.

*Melting Sugar* and *Tall Sugar* are two varieties with edible pods. The former is in season just before the *Stratagem*, while the latter follows the *Champion of England*. They are very tender and all parts cook nicely except the ventral suture, which remains stringy.

Best varieties for planting:

#### EARLY.

*Extra Early* or *Maud S*.

#### SECOND EARLY.

*Blue Beauty*, *Early May*.

#### MID-SEASON.

*Fill Basket*, *Heroine*, *Eugenie*.

#### LATE.

*Sutton Satisfaction*, *Champion of England*.

The following new varieties are promising:

*Dwarf No. 2*, *Universal*, *Exonian*, *Early May*, *American Champion*, *Dwarf Telephone*, *Eugenie*, *Sutton Satisfaction*.

TABLE NO. 2.—VARIETY TESTS OF PEAS.

VARIETIES. Arranged in order of their maturity.	Seedsman.	Per cent of germ- ination.	Height of vines.	No. days to edible maturity.	No. vines, pods per 100	Average No. peas per pod.	Per cent of peas to total weight.	Yield in ounces from 100 vines.	Yield of 100 Vines in Ounces.
Bergen Fleetwing.....	Gregory.....	73	2	48	526	4.1	59	72.7	
Burpee Best.....	Burpee.....	58	2	48	465	5	57	64.6	
Challenge.....	Currie.....	78	1½	48	398	6	48	61.3	
Extra Early.....	Ferry.....	74	1½	48	443	7	46	62.9	
Hancock.....	Gregory.....	79	1½	48	440	5.6	51	62.5	
Morning Star.....	Buist.....	74	1½	48	386	5	53	59.4	
Maud S.....	".....	61	1½	48	396	7	49	61.9	
Bergen X American Wonder.....	College.....	62	2	48	492	5.2	50	72	
Dwarf No. 2.....	Hicks.....	100	1½	48	326	5.7	55	69.1	
Dwarf No. 4.....	".....	92	1½	48	350	4.25	60	49.7	
Alaska.....	Ferry.....	79	2½	49	380	6.25	53	64.4	
Clipper.....	Rawson.....	80	2½	49	484	6	47	78.4	
Lightning.....	Dreer.....	45	2½	49	485	5	66	66.9	
Alpha.....	Ferry.....	50	2½	49	380	6.25	64.4	53	
American Wonder.....	".....	49	1	50	344	6	63.3	62	
Blue Beauty.....	Buist.....	28	1½	50	803	5.3	47	134.9	
Chelsea.....	Henderson.....	59	1½	50	405	5.6	56	79.4	

TABLE NO. 2.—VARIETY TESTS OF PEAS.—Continued.

VARIETIES. Arranged in order of their maturity.	Seedsman.	Per cent of germ- ination.	Height of vines.	No. days to edible maturity.	No. vines per 100	Average No. peas per pod.	Per cent of peas to total weight.	Yield in ounces from 100 vines.	Yield of 100 vines in ounces.
Premium Gem	Ferry	50	1½	51	370	6	52	79.2	79.2
McLean Little Gem	"	46	2	51	425	5.8	47	83.4	83.4
Universal	Childs	66	1¾	50	585	5	48	99.6	99.6
Kentish Invicta	Ferry	75	3	51	710	5.25	48	82.4	82.4
Wm. Hurst	Burpee	50	1½	52	420	5.5	63.5	81.5	81.5
Exonian	Thorburn	48	2½	53	569	5.3	52	97.5	97.5
Early May	Salzer	59	1½	55	785	7.7	52	139.7	139.7
Petit Pois	Henderson	67	3	56	800	6	51	121	121
Profusion	Burpee	30	2	56	678	5	48	134.3	134.3
Siratagen	Ferry	75	2½	61	445	4.6	52	76.7	76.7
Juno	Henderson	45	2½	60	567	5.7	55	123	123
Stanley	Dreer	53	2¾	60	470	5.1	50	98.5	98.5
Shropshire Hero	Maule	62	2½	60	445	5.5	55	85.9	85.9
Pride of the Market	Ferry	47	2	60	341	5.5	51	82.1	82.1
Gladiator	Henderson	48	2¾	61	378	5.3	49	82.5	82.5
Heroine	Dreer	30	2½	60	500	6.2	53	144.9	144.9
Heroine	Henderson	52	2½	61	425	6.3	45	112.8	112.8
Abundance	"	23	3	61	844	5.2	49	148.8	148.8

Bliss Everboaring.....	Ferry.....	47	2½	61	571	5.2	47	109.7	
Blue Imperial.....	".....	78	2	59	380	4.75	45	97.3	
Yorkshire Hero.....	".....	25	2½	68	441	4.8	52	106.7	
Melting Sugar.....	".....	91	5	58	510	5.4	45	104.2	
Telephone.....	".....	25	4½	60	270	5.7	52	65.5	
Forty Fold.....	Buist.....	45	4	61	565	4.6	49	101.1	
Admiral.....	Ferry.....	80	8	61	745	7	52	137	
Telegraph.....	".....	62	3½	59	470	6.6	46	125	
Telegraph.....	Dreer.....	54	3½	60	480	6.4	41	138	
L. L. Mammoth.....	Childs.....	57	3½	59	731	5	55	137.4	
Evolution.....	Henderson.....	52	3½	61	530	6.1	18	132.5	
Fillbasket.....	".....	25	2½	62	646	7	52	187	
Engenie.....	Buist.....	28	2	63	741	6.8	52	173.4	
Market Garden.....	Henderson.....	60	2½	68	590	5.9	65	133.8	
Dwarf Telephone.....	Hicks.....	87	1½	62	309	7	47	145.7	
Champion of England.....	Ferry.....	31	5	63	785	7.2	52	106.2	
American Champion.....	Henderson.....	36	8½	62	409	5.5	48	128.4	
Duke of Albany.....	Ferry.....	40	3½	63	399	5.1	51	98.4	
Sanders Marrow.....	Henderson.....	28	5	65	768	8.2	34	135	
Sutton Satisfaction.....	Currie.....	6	2½	65	827	5	44	202	
Tall Sugar.....	Ferry.....	66	5	73	520	5.7	45	98	

## BUSH BEANS.

H. P. GLADDEN.

Beans do best in a rather light, well drained soil. Although, in ordinary soil, a fair crop may be grown without the use of manure, its application, in a well-rotted form, can be made with profit.

If the garden is laid out in long rows, which is the preferable way, as it permits the use of the horse cultivator, the drills should be from two and one half to three feet apart, but where the work is done by hand, the rows may be as near as fifteen or eighteen inches. The beans should be sown two or three inches apart in the drills, and, after covering two or three inches deep, the soil should be firmly pressed over the seed.

Beans are easily injured by cold or excessive moisture. It is usually safe to plant the first crop at the time corn is planted. For a succession sow every two or three weeks until the first of August.

Care should be taken to give the plants shallow cultivation, as disturbance of the roots, especially during the blossoming period, will result in a decreased crop.

There are many varieties of bean, differing in earliness, productiveness, and in the size, color, and quality of pod and seed. Of the green-podded varieties, a well selected strain of *Red Valentine* will prove satisfactory. For a family garden preference is given to the wax-podded sorts. *Cylinder Black Wax* is very productive, with long, round, and light yellow pods. This variety planted in succession will give snap beans that are tender and of best quality throughout the season. *Mammoth Wax* and *Butter Wax* may also be mentioned in this class. As a shell bean, *Dwarf Horticultural* or *Goddard Bush* are excellent. Among the recent introductions may be mentioned *Speckled Wax*, very promising as a snap bean and later as a shell bean.

## POLE BEANS.

This class of beans is very tender and should be planted two or three weeks later than the bush beans. The rows should be from four to five feet apart, with four feet between the hills. The poles, which should be about eight feet long, can best be set in place before the beans are planted, as disturbing the young plants injures their growth. It is well to make the hill quite rich, by working into the soil a shovelfull of well composted manure.

*Golden Cluster* is an excellent pole snap bean. The plants are strong growing and very productive, and the pods are large, tender, and of the best quality. *Golden Champion* is also a good variety.

The *Pole Limas* are late in maturing and are usually killed by frost before much of the crop has been gathered.

A variety worthy of special mention is the *Horticultural Lima*. It is productive and ripens the crop before frost comes. It is unexcelled as a green shell bean and is a good cooking bean when mature.

*Warren, Gregory*. A recent introduction. Plants of strong, vigorous growth; pods three to four inches long, usually straight; flesh thick, tender, and of best quality. The plants are productive and the pods mature successively for a long season. An excellent home variety.

## CELERY.

Celery is seldom grown in the farm garden, as its cultivation is thought too difficult for the amateur. The growing of this excellent vegetable is not so hard as imagined and it should receive more attention than is now given it. The seed should be sown early in the spring. Select a level spot and make it rich with well rotted manure. Thoroughly pulverize the soil and sow the seed in rows about eight inches apart. The seeds are small and an ounce will produce over five thousand plants. When the plants are three or four inches high the tops should be clipped to make the plants stocky. To grow good celery it is quite necessary that the soil be heavily manured and one that will not dry out, and, if possible, loose and deep, though good celery may be grown on clayey ground. The rows may be four or five feet apart and the plants six inches distant in the rows. The plants should be set not deeper than they were in the bed and the soil firmly pressed about the roots. When the plants are about ten inches tall the celery wanted for fall use should be banked up to blanch it; this operation should be repeated as the tops grow. The celery intended for winter storing should be earthed sufficiently to induce the stalks to grow upright. Celery will stand several degrees below freezing without serious injury. About the first of November the plants should be placed in trenches or in the cellar to blanch for winter use. If stored outside, trenches should be dug eight or ten inches wide and as deep as the celery is tall. The earth should be loose at the bottom of the trench. The plants, with the roots on, are taken from the rows and packed closely in the trench with the tops even with the surface. As cold weather comes on the tops should be covered gradually, with some loose material, until they are protected from serious freezing. Celery may be placed in the cellar by having boards eight or ten inches apart to prevent packing in a compact mass. Soil should be packed about the roots that they may start to grow, as this growth in the trench or cellar blanches the stalks. Earth is not necessary between the stalks.

The dwarf varieties seem to give better satisfaction than the larger growing kinds. *Golden Self Blanching* and *White Plume* are good varieties. If a pink sort is desired, *Rose* will give good satisfaction.

## CUCUMBERS.

Cucumbers prefer a light sandy loam well enriched. The rows may be five to six feet apart, and the hills three or four feet distant in the rows. In this locality, June 1 to 10 is the time to plant. The striped beetle is very troublesome to the young plants. A good way to protect the plants is to grow them for a time under a cover of netting or wire screen fastened on a frame. When the plants are well started they will keep ahead of the insects. Seed should be planted every two or three weeks to provide a succession through the season. Plants will continue to produce fruits much longer if no cucumbers are allowed to ripen on the vines.

One of the best varieties to grow for general use is *White Spine*. There are several strains of this variety differing somewhat in growth, productiveness and in time of maturing. *Fordhook Improved White Spine*, Burpee, is one of the best of its class. The plants were very strong growing and

productive and the cucumbers large and perfect in form. As a sort for growing pickles and for early table use *Russian* is good. The fruits are small but are produced in large numbers. As a later variety *Long Green* may be mentioned. The cucumbers are large and among the best for table use.

#### LETTUCE.

A common mistake made in growing lettuce is in having the plants too close together. To reach perfection the plants should be ten to fifteen inches apart in the rows.

Lettuce is quite hardy and the seeds can be sown quite early. To provide a succession sow every two or three weeks.

As varieties for general growing *Black Seeded Simpson*, *Hanson*, *Grand Rapids*, and *Prize Head* are among the best.

The following are sorts of recent introduction:

*Onondaga*, Burpee. It forms a large compact head. The outer leaves are curled, yellowish green with brownish red edges. The inner leaves are rich yellowish green in color and of excellent quality. It stands heat well and is a promising variety.

*Iceberg*, Burpee. *Ice*, Pitcher and Manda. The heads are of medium size; leaves somewhat curled and wrinkled, edges brownish red. Every plant formed a good head during very dry weather. Its handsome appearance, high quality, and ability to withstand drouth make it well worthy of general planting.

#### SALSIFY.

This vegetable is of such easy culture and so little known that a few words in its favor may not be out of place. Sow the seed early in spring in drills. If hand cultivation is practiced the drills may be twelve or fifteen inches apart. The plants should be thinned out if they are growing too close. Late in the fall the roots may be stored in the cellar or a trench outside for use during the winter and spring. They may be left in the ground until spring without injury to the roots. The roots make a most excellent dish and the vegetable would be largely grown were its good qualities more generally known.

#### SQUASHES.

Of late the squash vine borer has made the growing of this vegetable somewhat uncertain, though a large proportion of the damage supposed to be done by the borer is due to a fungus which attacks the vine. Corn cobs soaked in coal tar and placed about the hills when the plants are small repels the moth that lays the eggs which produce the borer. The tar should be renewed every four or five days. The striped beetle may be kept away by covering the plants as recommended with cucumbers. A tablespoonful of turpentine mixed with a pailful of ashes and sprinkled on the plants early in the morning has been quite successfully used to keep away the beetles.

*Summer Crookneck* and *White Bush Scallop* are usually planted for early squashes. *Long Island White Bush*, a recent introduction, seems to be an improvement upon the usual type. The plants are very productive

and the squashes larger, smoother, and more regular in form than the common *Bush Scallop*. *Boston Marrow* is a good fall and early winter squash. *Hubbard* and *Marblehead* are among the best for winter use. *Essex Hybrid* is a productive sort and the squashes are of good quality; by some they are preferred to the *Hubbard* for fall and early winter use. *Cocoanut* and *Fordhook* are strong growing varieties which are almost sure to bear a large crop. The squashes are small, but of good quality.

*Delicata*, recently introduced by Henderson, belongs to the above class. The plants are strong growing and healthy. The squash is about six inches long and three to four inches in diameter. It is of a rich, creamy yellow color and the flesh is dry and of excellent quality. Matures the last of September. Somewhat similar to *Fordhook*, but is less ridged and more oval in form.

### TOMATOES.

The seed was sown in the forcing house April 1. The plants were set out June 6 and 7. The rows were six feet apart and the plants set four feet apart in the rows. The trellis described in bulletin No. 57 was used to support the vines. Ninety varieties or strains were grown. The table given below shows the time of ripening and the yield of a few of the older and better sorts, and of the new varieties grown. Six plants were set of each variety. All the ripe tomatoes borne on these six plants were picked and weighed. After the frost had killed the vines the green tomatoes were also gathered and weighed.

The variety which has given best satisfaction, as an early tomato, for several seasons is *Earliest*, from Vaughan. The six plants supposed to be *Earliest* in the experimental plot were not true, so that a comparison for this year could not be made. Our field planted for general use contained a large setting of *Earliest*, and here it was the first, by several days, to ripen fruits.

*Advance*, which is a little later than *Earliest*, but bears a smoother fruit, shows up well as an early sort.

*Ignotum*, *Lorillard*, and *Optimus* may be recommended as among the best for the general crop.

The following notes on some of the new varieties may be of interest:

*Royal Red*.—Dreer. Careful comparison could note no differences in plants or fruit from *Ignotum*, though *Royal Red* ripened fruits a week earlier and the tomatoes averaged much smaller in size.

*Buckeye State*.—Livingston. Plants are strong growing; fruit grows in clusters, is round and of good size, color a uniform pinkish red; flesh solid and walls thick. Free from rot and does not crack. Promising.

*Belmont*.—Gregory. Plants are strong growing and spread but little. Fruit round or somewhat oblong, many-celled and cell walls very thick, few seeds in cells; color bright, light red, does not ripen well around stem.

*Terra Cotta*.—Thorburn. This is one of the *Rural New Yorker's* cross-bred tomatoes. The type is not fixed and the fruit varies greatly on the different plants. The typical fruit is of medium size, nearly round, with slight ridges or irregularities. It has very thin skin and the cells are close to the outside and have thin outer walls. The center of the tomato is solid and the flesh is bright red in color, juicy, and fine flavored. A novelty in tomatoes and possessing many points of excellence.

TABLE 4.—TOMATOES, TESTS OF VARIETIES.

Variety.	Seedsmen.	Date first ripe fruits.	Yield of ripe fruits in August.		Yield from Sept. 1 to Sept. 12.		Yield from Sept. 12 to Sept. 25.		Total number of ripe fruits.	Total weight of ripe fruits.		Average weight of ripe fruits.	Weight of green fruit left on vines.
			lbs.	oz.	lbs.	oz.	lbs.	oz.		lbs.	oz.		
Advance	Burpee	Aug. 14	26	5	20	6	25	5	561	72	0	2.00	22½
Acme	Gregory	Sept. 30	8	14	12	8	21	5	200	42	11	3.41	12
Ignotum	College	Sept. 2	0	15	15	9	53	13	158	70	5	7.12	34½
Potato-leaf	"	"	1	2	30	9	30	9	141	62	4	7.06	81
Mitchell	Maule	Aug. 29	"	"	30	4	21	10	174	51	14	4.77	77½
Optimus	Berthoud	" 30	"	"	33	2	33	15	201	67	1	5.33	66
Lorillard	"	Sept. 6	"	"	37	2	46	9	255	83	11	5.19	82½
Ignotum	"	" 4	"	"	41	1	35	10	162	76	11	7.58	90
Potomac	Harris	Aug. 29	6	12	27	2	16	14	91	50	12	8.92	66
McCollum Hybrid	"	Sept. 2	0	13	11	10	11	7	80	23	14	4.77	51
Potato-leaf Ignotum	College	Aug. 16	15	1	32	9	11	1	135	58	11	6.08	51
Picture Rock	Childs	" 16	16	5	21	15	18	9	224	56	13	4.05	60
Climbing	"	" 15	6	3	21	6	12	12	140	40	5	4.60	25
Majestic	Buist	" 19	16	0	10	13	13	1	190	39	14	3.32	21
Prize Belle	"	" 22	7	11	12	11	22	9	163	46	2	4.39	36½
Royal Red	Dreer	" 26	8	14	9	6	15	15	156	84	3	3.50	28¼
Buckeye State	Livingston	" 30	0	13	13	3	22	13	84	36	13	7.01	52¼
Belmont	Gregory	" 22	6	7	21	0	15	12	163	43	3	4.11	42
Terra Cotta	Thorburn	" 30	5	8	29	14	31	10	206	67	0	5.20	51¼
Lemon Blush	"	" 26	5	7	36	6	23	11	171	65	8	6.12	50½
Early Michigan	Ferry	" 30	4	14	40	14	29	3	196	74	15	6.11	97
Nichol No. 5	Nichol	" 31	6	5	16	5	48	11	161	71	5	7.09	71
The Stone	Dreer	Sept. 4	"	"	4	7	16	0	37	20	7	8.84	106½
Trophy	Vaughan	" 2	2	15	22	1	18	5	74	43	5	9.36	81½
Richmond	Landreth	Aug. 12	18	11	8	9	15	1	180	42	5	3.76	30
Comrade	Gregory	" 16	17	0	13	15	8	4	274	39	3	2.25	20
The Shah	Henderson	" 22	8	4	10	12	9	12	96	28	12	4.79	25
Giant Tree	Salzer	" 22	9	0	40	7	4	14	147	54	5	5.91	55
First Ripe	"	" 18	7	6	18	12	11	10	130	37	12	4.41	35
Trucker Favorite	Burpee	" 22	6	12	40	7	14	13	184	62	0	5.39	50
Matchless	"	" 22	7	11	40	13	19	12	186	68	4	5.87	58
Red Ponderosa	College	Sept. 2	0	11	30	9	30	13	103	62	1	9.64	56
The Ever Fruitful	Pitcher & Manda	" 2	1	15	23	1	36	7	132	61	7	7.44	64

*Lemon Blush*.—Thorburn. Another of the *Rural New Yorker* tomatoes. Plants of very strong, upright growth. Fruit of medium size, round, regular form. It has very thick outer walls, few cells with many seeds and the flesh is juicy and more acid than is usual for yellow tomatoes. Color a rich light yellow. A promising yellow sort and a distinct type.

*Early Michigan*.—Ferry. An improved type of the old *Red Apple*. Plants very vigorous, the branches growing in a close mass. It was not very early but the plants are very productive and the fruit is of good size, regular form, bright red color, and free from rot or cracking. One of the best.

*Nichols No. 5*.—Nichols. A tomato of the potato-leaf type, but the plant grows stronger and more upright. Fruit a lighter pink and of more solid flesh. The plants are productive and the tomato an excellent shipper.

*Richmond*.—Landreth. Plants are not of strong growth. Fruit small to medium in size, rough and angular in shape and many-celled. One of the first to mature fruits. Valuable for its earliness.

*Comrade*.—Gregory. In plant and fruit closely resembles *Advance*, though fruit is a brighter red and has more green around stem. Also some fruits are much larger than *Advance*.

*First Ripe*.—Salzer. Plants strong and of low spreading growth. Fruit round, of medium size, smooth, bright red color; flesh solid, juicy, and quite acid in flavor. Matures early and plants fairly productive.

*Trucker Favorite*.—Burpee. Plants strong growing and productive. Closely resembles *Acme* in plant and fruit. A valuable market sort.

*Red Ponderosa*.—College. Very similar to *Ponderosa* in plant and form of fruit but the color is red. Plants are productive and ripened a good amount of fruit before frost came.

*Ever Fruitful*.—Pitcher & Manda. Plants are strong growing and set a large amount of fruit. Fruit large, regular form, and light red color; flesh not very firm but of good quality. No rot appeared and fruit does not crack around stem. Resembles *Ignotum* but the tomato is more spherical in form.

*World's Fair*.—Reed. This proved to be the old *Red Pear*, an early ripening sort of but little value.

AGRICULTURAL COLLEGE, {  
February 10, 1894. }



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EXTRACTS FROM PROCEEDINGS

OF THE

NEW YORK HORTICULTURAL SOCIETY.

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S. D. WILLARD.

BIOGRAPHICAL SKETCH  
OF  
S. D. WILLARD,  
OF GENEVA, N. Y.

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Michigan horticulturists will gladly see in this volume a portrait of the New York pomologist with whom, because of his frequent visits among them, they are most familiar. He has attended many meetings of this society, and at each one he has given freely of his valuable experience and terse, sound advice. His papers read before it have been widely published and distributed in the State and have had a marked effect upon the work of our fruitgrowers. It is no more his great worth as a horticulturist, however, than his abounding good nature and genial ways that have endeared him to us. Few men have so rare a combination of qualities which make them an aid and a pleasure as has Mr. WILLARD, and few are more generous in revealing the methods which have been the source of their success with fruits. He has come to be so much expected, that a meeting which lacks his presence is felt to have sustained a misfortune; and the warmest of welcomes is ever ready for his coming.

Mr. S. D. WILLARD was born and brought up on a farm on the banks of Cayuga lake, where fruitgrowing has ever been regarded as an important interest, and with such surroundings a taste for horticulture was developed at an early age, which in more mature years led him to engage in the nursery business at Geneva, and with it the growing of fruit for commercial purposes.

The success with which the plum was being grown, twenty-five years ago in the country adjacent to the Hudson river, attracted the attention of Mr. WILLARD, and induced him to make this a leading feature in his orchard work.

Mr. WILLARD has imported many new varieties for the purpose of testing their value as orchard sorts, and he is now fruiting about fifty varieties, many of which he finds of no practical value to the orchardist, but the experience thus obtained he regards of great value to him in the work in which he is engaged.

He believes the nurseryman should also be the grower of fruits, and that the commercial orchardist should not pin his faith too strongly upon the production of any one of the many fruits that can be grown so successfully in western New York. He was the first to plant the Kieffer pear as an orchard tree in New York state, and has ever been a strong advocate of this variety as a profitable orchard fruit. His faith is shown by his works, as he continues to plant largely of the variety, and has recently shipped a car load of the fruit to Chicago to parties who have been handling it there for him for several years. He is a believer in thorough drainage and regards it unwise for any one to plant orchards on land which is not naturally or artificially well drained.

As he is now approaching sixty years of age, with no boys to take up his work, he feels that he must contract his efforts for the future, but declares that were he thirty years younger his future planting would be measured only by his means, and that, if possible, he would be the owner of the largest fruit orchards in America, so great is his confidence in the future of this industry.

He has been wonderfully interested in fruitgrowing in northern Michigan, and has often declared that, were he younger, this northern region would offer to him inducements more attractive as a field for operations in fruitgrowing than any other section he had ever looked upon.

He is a strong advocate of growing the greatest variety of all adapted to the section of the orchardist and required by the markets patronized, and fully believes that the Michigan lake shore is well adapted to the production of a wider range of such products than has generally been supposed.

In his own work, while prominence is given to the plum, the pear, cherry, quince, apple, apricot, and many of the small fruits come in for their full share of attention.

Mr. WILLARD is no theorist, but thoroughly practical and knows well the nature and habits of every tree of which he is the owner. For years he has been one of the most active members of the Western New York Horticultural society, of which he is vice president. He is a member of the executive board of the State Agricultural society, the horticultural department of which, under his management, has grown to be the finest in its exhibit of any state in the union.

# WESTERN NEW YORK HORTICULTURAL SOCIETY.

EXTRACTS FROM PROCEEDINGS AT ANNUAL MEETING,

JAN. 24-25, 1894.

## PRESIDENT W. C. BARRY'S ADDRESS.

### *Members of the Western New York Horticultural Society:*

GENTLEMEN—To-day we are assembled to hold the thirty-ninth annual meeting of this society. At this time I can with propriety congratulate you upon the prosperous and flourishing condition of this organization. There are now nearly four hundred members enrolled, and with a little effort the number can be increased to five hundred. The attendance at the meetings has been large, and great interest has been manifested in the proceedings. The annual reports are valuable compendiums of practical and scientific information and are indispensable to the progressive horticulturist and fruitgrower. For this success much credit is due to the scientists, who have honored us with their presence at the meetings, and who have so liberally contributed to our fund of experience and information through their papers and addresses. I avail myself of this opportunity publicly to acknowledge our obligations to them for the interest they have shown in the society's welfare.

### THE OUTLOOK FOR FRUITGROWERS AND TERRACULTURISTS.

The present outlook for fruitgrowers is not by any means hopeful; on the contrary the prospect is rather discouraging. This industry, like almost every other, has suffered from several causes. Many will attribute their failures to excessive production, while some will ascribe their losses to the ravages of diseases and insects. I will not attempt now to trace the causes of failure, but rather to suggest some means to meet and overcome the difficulties which confront us. As regards excessive production, all are agreed that there is annually sent to market an over supply of indifferent fruit. Buyers and consumers everywhere complain that not enough attention is given to the production of high grade fruit and that consequently the markets at certain times become glutted with an article, the sale of which has to be forced. Gathering, handling, sorting, and packing come in for their share of criticism and condemnation. It is therefore obvious that every fruitgrower and horticulturist should give more care and attention to these important details. The best business methods should be adopted. The demands of the various markets should be attentively studied; old and worn-out machinery and tools should be discarded, and labor-saving devices and implements should be employed, so that the greatest economy in labor can be practiced. Wastefulness of all kinds, in cultivation and management, should be avoided, and expenses reduced. When competition is so keen, success is impossible if we do not keep fully abreast with the times both in thought and methods.

The youth who propose to follow this pursuit should prepare themselves by a course of study at an agricultural school, where the dignity and importance of their calling will be impressed upon them and where a desire for knowledge and a taste for study and science will be acquired. The condition of affairs in the cities of this country to-day furnishes evidence enough, that it is unwise and foolish to forsake the farm with a view to bettering one's self at other industries; thousands are now out of employ-

ment and without homes; many are without the necessities of life. Is it not possible to encourage the young men to believe that the opportunities for reward upon the farm are as great, if not greater, than elsewhere? Should not the advantages and pleasures of an out-of-door life, and the disadvantages of indoor occupation, be considered and compared? Do we fully realize what a privilege it is to possess acres of good land, pleasantly located and producing satisfactory crops? The farmer and fruitgrower are ever in close communion with Nature, and as Lubbock says:

"Happy indeed is the naturalist; to him the seasons come round like old friends; to him the birds sing; as he walks along the flowers stretch out from hedges or look up from the ground, and as each year fades away, he looks back on a fresh store of happy memories. Every week brings some fresh leaf or flower, bird or insect. Every month again has its own charms and beauty. We sit quietly at home and Nature decks herself for us; and yet too many of us see nothing in the fields but sacks of wheat, in the meadows but trusses of hay, and in woods but planks for houses or cover for game. Even from this prosaic point of view, how much there is to wonder at and admire in the wonderful chemistry which changes grass and leaves, flowers and seeds, into bread and milk, eggs and cream, butter and honey."

This picture is not overdrawn, and yet how often do we find that these beautiful conditions are ignored, the pleasant country home forsaken and city life preferred. How many surrender all the advantages of rural life and pass their days in small, dingy, badly ventilated offices, or behind the counters in crowded stores—occupations which afford few opportunities for real pleasure, and which rarely furnish great rewards, while the close application and constant confinement impair health and frequently bring on bodily ailments which become permanent in the course of time.

On the other hand, the young man on the farm is led to believe that there is no money in fruit-growing or farming. Hard work and small pay are the only inducements offered him. It is not strange that, under many existing conditions, he becomes discouraged and turns his back on his old home; the lands are exhausted, buildings are falling to pieces, crops small, and returns unsatisfactory; encouragement and advice are never given, but, on the contrary, every attempt at improvement is ridiculed and belittled. In this state, with its rich and varied soil, and unsurpassed climate, tillers of the land possess advantages which are not enjoyed by any other people on this globe.

Secretary Morton reminds the croakers that only about three per cent. of all merchants escape failure; whereas hardly three per cent. of the farmers fail. Statistics show that agriculture is safer than banking, manufacturing, or railroading; taking all things into account, there is no farmer, he says, of good sense and good health, who can not make a good living for himself and family, and that is as well as the majority of men are doing in any other pursuit. And there are numerous instances of profitable farms and well-to-do land owners, but every one of them attributes his success to industry, perseverance, vigilance, and intelligent effort.

There seems to be no good reason why farming and fruitgrowing should not pay well, if the business be conducted on correct business principles. Let those advanced in years make way for those who are soon to succeed them. Give the young men a chance and let their standard be a high one. There should be no scrub stock on the farm; horses, cattle, sheep, swine, and poultry should all be of the best breeds, and attention should be given to develop breeds suited to special purposes. Cultivate only so much land as can be properly cared for. A few acres well tilled will yield more profit than a larger number half cultivated. This assertion is verified in the old countries where land is scarce and where consequently high cultivation is imperative.

Enthusiasm and a desire to excel should be infused into every undertaking. Then will the farm be cared for and not forsaken, and an intelligent course of tillage adopted; sterile fields will become fruitful, and our country will boast of a sturdy, enlightened class, happy in the enjoyment of God's greatest gift to man—good health and proud of their possessions.

In the words of Whittier:

Give fools their gold, and knaves their power,  
Let fortune's bubble rise and fall,  
Who sows the field, or trains a flower,  
Or plants a tree, is more than all.

For he who blesses most is blest  
And God and man shall own his worth,  
Who toils to leave as his bequest  
An added beauty to the earth.

And soon or late to all who sow  
The time of harvest shall be given;  
The flower shall bloom, the fruit shall grow,  
If not on earth at least in heaven.

## AGRICULTURAL AND HORTICULTURAL LITERATURE.

There is nothing that will tend to make home more pleasant and attractive than a good library, and especially in the case of the farmer and fruitgrower, who during a portion of the year have much time to spare indoors. A good weekly horticultural and agricultural paper is a necessity. The reports of the experiment stations, as well as those of the department of agriculture, should be obtained and read carefully. These pamphlets are prepared with great care and embody the latest information on questions of the highest importance to every tiller of the soil. Most of these publications are sent free on request, so that a library can be started easily and inexpensively. The experiment stations, too, should be consulted whenever questions difficult of solution present themselves, and much time and experience will be gained in that way, and expensive errors avoided.

## PROGRESS MADE IN CONTROLLING INJURIOUS INSECTS AND FUNGUS DISEASES.

The great losses which have been sustained the last few years in consequence of injurious insects and fungus diseases, have almost discouraged fruitgrowers; but, thanks to the scientists, relief is at hand. Effectual remedies have been proposed and applied with success. Spraying is now practiced quite generally and with satisfactory results. The codlin moth, or apple worm, bud moth, tent caterpillar, canker worm, plum curculio, currant worm, cherry and pear slug, apple scab, black knot and grape mildew are all recognized, understood, and controlled. It is surprising how effectually and inexpensively the work can be done by those who have had some practice. I can not allow the occasion to pass without referring to the agricultural department, under whose direction so many experiments have been made, and so many successful remedies suggested. The value of various kinds of insecticides and fungicides has now been fully determined and established, so that the different formulae can be relied upon. But not until the practice has become more general will the results be noticeable; every owner of a fruit farm, or even a fruit tree, should procure a spraying machine and learn how to operate it. Apathy, prejudice and ignorance should no longer prevent the adoption of remedial measures.

A systematic treatment should be carried on throughout the state. Nothing will be gained unless a general effort is made. Let there be concert of action on the part of the growers and let the work proceed in such a manner and on such a scale as will secure the desired results. Let there be no pest breeding places. If our neighbors are not sufficiently aroused to the necessity of prompt action, appeal to them and show them the danger and losses which they will incur if they do not join in the work. If the multiplication of parasitic fungi and insects continues, and no attempt is made to hold them in check, efforts in the other direction will be unavailing and all will be obliged to give up fruitgrowing. Bulletins 48-60 of Cornell University experiment station on "spraying of orchards" should be consulted and kept at hand for ready reference.

## THE EYE SPOTTED BUD MOTH.

Among the most serious insect pests which have caused great injury to fruit trees is the eye spotted bud moth (*tmetocera ocellana*). I referred to this pest in my address of 1892, and quoted the remedies suggested by Dr. Fernald of the Massachusetts Agricultural experiment station (in bulletin No. 12). During the years 1892 and 1893, Mr. Mark V. Slingerland of Cornell University, traced the life history of this insect and studied its habits, and published the results of his observations and investigations in bulletin No. 50, March, 1893, a pamphlet I advise all to secure. This pest seems to have made its first appearance in this country in Massachusetts, about 1841, and is now widely distributed. For a number of years it has done considerable damage, but not until recently have the evidences of harm been so marked. Mr. Slingerland says this pest makes its presence known early in the spring, as soon as the buds begin to open, usually about the 1st of May, on early varieties, and a week or ten days later on late varieties.

The caterpillars work in opening fruit and leaf buds, often eating into the buds, especially the terminal ones, so that all new growth is stopped. Such work, in all but a few buds on a nursery tree, especially, soon checks and disfigures its symmetry of growth and often spoils the tree, for marketing. He recommends spraying about the middle of April to combat the pest successfully.

## EXPERIMENTING IN PREVENTING LEAF DISEASES OF NURSERY STOCK IN WESTERN NEW YORK.

During the seasons of 1891 and 1892 several experiments were made by Mr. D. G. Fairchild, of the department of agriculture, at Geneva, with a view of preventing the various leaf diseases in nursery stock. The object of these experiments was to deter-

mine whether the leaf blight of pear, cherry, plum, and quince stocks, and the powdery mildew of the apple, could be prevented by the use of Bordeaux mixture or ammoniacal solution of copper carbonate. In nearly all cases the experiments were successful, and already nurserymen are spraying their stocks to prevent defoliation. A report in detail of the experiments is furnished by the agricultural department.

#### READ THE BULLETINS OF THE AGRICULTURAL EXPERIMENT STATIONS.

The mailing lists of the various stations in the United States show that only about 300,000 of the farmers are taking advantage of the benefits of the stations. The work done at the stations is being more and more appreciated from year to year, and while the number receiving bulletins is small comparatively, yet it is evident that a beneficial influence is being exerted. At the different stations in the United States there are at present 71 directors, 120 chemists, 47 agriculturists, 50 horticulturists, 30 botanists, 36 entomologists, besides others who assist in different ways. This great work is now permanently established, and it will be difficult to estimate the good results which are to follow if the bulletins are studied and the recommendations put in practice.

#### WINDBREAKS FOR THE PROTECTION OF ORCHARDS.

The wind storms of September last which were so destructive to fruit, teach a lesson which should not be forgotten. Although such storms are of rare occurrence, yet, early in the autumn, it is not unusual to have high winds which cause the largest and best fruit to drop, and it seems advisable that planters should prepare for such emergencies by planting on the north and west sides of their orchards, windbreaks either of evergreen or deciduous trees. Care must be taken not to surround the orchard, for in that case the air would be too much confined. These windbreaks will also be a protection against winter storms.

#### THE EXHIBIT AT THE STATE FAIR.

Through the efforts of Mr. Willard and others the exhibit of fruit made by this society at the state fair in Syracuse was a great success. The possibilities of fruit-growing in this state was there demonstrated in the most effective manner, and at the same time the members of this society proved beyond a doubt that they could and did produce choice fruit.

It is to be hoped that the interest and enthusiasm manifested in the exhibit will increase from year to year. Every member should exhibit something and preparations should be made in season.

#### THE MISSION OF THIS SOCIETY.

I can not too frequently impress upon you the usefulness of this association and the importance of the work it has on hand. The present, when business generally is so depressed, is a most opportune moment to revive interest and enthusiasm in fruit-growing and farming. Horticulturists, recognizing the losses and reverses sustained by those engaged in other industries, will begin to place a higher estimate upon their own resources and the stability of their calling, and will be encouraged to greater efforts than before. Intelligent and thorough culture of the soil will bring its reward and insure a regular and reliable income which can not be affected by conditions such as influence and often injure other industries. The produce of the earth if grown with care will find a ready market, and though there may seem to be at times an excessive production, the laws of supply and demand will regulate the production and maintain prices, so that a sure and safe livelihood will be gained for all who persevere and labor honestly, industriously, and intelligently. Let us therefore study the demand and vary the crops as may be necessary. Do not devote too large an acreage to one crop. Rather plant several, so that if one fails another will succeed. In fruit this is particularly true. As the year advances be prepared to offer the fruits of the season, in their highest perfection, and thus secure ample returns from June until December. It is the purpose of this society to encourage and foster fruit culture, and to elicit and disseminate correct information pertaining to it as well as to other branches of terra-culture. Much good has been accomplished thus far; let us therefore continue to work harmoniously, seeking higher degrees of improvement in the fulfillment of our mission, and in the words of the sturdy invocation of Gerard:

"Forward in the name of God; graft, set, plant, and nourish up trees in every corner of your ground; the labor is small, the cost is nothing, and commodity is great; yourselves shall have plenty, the poor shall have somewhat in time of want to relieve their necessity, and God shall reward your good merits and diligence."

## RIPENING AND PRESERVATION OF FRUITS.

BY DR. G. C. CALDWELL, PROF. OF CHEMISTRY, CORNELL UNIVERSITY.

The decay of fruit is the final ending up of a series of chemical changes, the beginning of which is away back at its first appearance after the flower withers and dies. The green fruit behaves like a green leaf; it takes up carbonic acid from the air, and water from either air or soil, and gives off oxygen, and makes what we call vegetable substance, such as cellulose of the walls of the multitude of very little cells or chambers of which the fruit is built up, and which increase in number and size as the fruit grows as we make a house larger by adding on more rooms, or adding to the size of those that we already have. Then, in these cells, other vegetable substances are stored, such as starch, fats, acids, pectin bodies, tannin, albuminoids and so on—perhaps not all of them in the very youngest fruit, but all of them, sooner or later, and others besides.

But, in the building up of the fruit, and stocking its multitude of cells, the fruit itself is by no means required to do the whole of the work: it receives help from the other green parts of the plant, whether a shrub or a tree, or a mere garden plant, like the tomato. In the case of real fruits the most interesting stage of chemical change is that of the ripening period, during which the fruit changes color, becomes softer, usually sweeter and less astringent or puckering. The fruit loses its power more and more as the departure from the original leaf green color widens, of making the material for its own growth out of carbonic acid and water, and such matters as are drawn from the soil; and instead of taking up carbonic acid and giving off oxygen, it comes more and more to behave like animals in their respiration. It takes up oxygen and gives off carbonic acid, and it comes to be entirely dependent on the green parts of the plant. The leaves, for whatever more it may need of new building material, or of material to put into its cells. This process of respiration in animal results, as you know, in a slow burning up of certain substances in the body. Heat is a product of the operation, as heat, more or less intense, is a product of all burning, whether slow or fast; if slow we may see no fire, but there is heat nevertheless, and it is this heat that makes the living animal body warm. So, if the ripening fruit takes up oxygen and gives off carbonic acid, a slow burning must take place in it also; tannin is probably burned first, or is among the first substances to be destroyed; the puckery character of the fruit gradually lessens, and finally disappears altogether, as one of the important phases of the ripening. This is true at least of the grape, and in all probability of fruits in general.

Insoluble pectose substances change to soluble and the fruit become softer especially toward the end of the ripening process. The proportion of albuminoids increases and consequently the fruit becomes more nutritious. The most important changes that take place, however, are in respect to the sugar and the acids. These changes have been studied more than any others; for upon the relative proportions of these two constituents, as well as on those subtle substances that give aroma and flavor, the eating qualities of the fruit depend altogether. The proportion of sugar increases from the beginning—sometimes steadily, as in the peach and strawberry. In the gooseberry and cherry a sudden increase has been observed at just about the time when there is a correspondingly rapid growth in the size of the berry. In the grape the sugar increases rapidly also through a certain period, which some investigators make out to be longer than others, and some make later in the season than others do.

The proportion of acid also usually increases through at least a large part of the period of ripening; but in the case of some fruits it afterward falls off, and in some cases, as in the strawberry, it may rise again. In the grape the acid seems to diminish steadily, and it has been supposed that it was converted into sugar—a change which, though not possible in our chemical laboratories, may be brought about in the plant's laboratory. But it is not probable that this is the source of the sugar. It has been fairly proved that sugar is transported into the fruit in the current of sap from the leaves; and it is generally believed that when the acid increases too, it also is carried into the fruit from without.

While, in the grape, the greater sweetness of the ripe fruit, as compared with that which is only partially ripe, may be due to the lessened proportion of acid, as well as the increased proportion of sugar, it is evident that this can not be the case in those fruits whose acid increases as the ripening progresses. The ripe fruit is sweeter only because the sugar increases more rapidly than the acid does.

As fruits differ in their method of ripening before being plucked, so do they differ, and much more, in their methods of after-ripening, when detached from the plants on which they grew. All fruits undergo a certain amount of ripening on the tree or vine: but

some ripen no further when detached therefrom, while others need to be picked before fully ripe in order that we may finally have them at their best. As to the grape, the best authorities find no after-ripening, or no chemical change taking place that makes the fruit better; others find some diminution of the acid, without any loss of sugar, which would make the fruit sweeter. But I do not know that any one will affirm that the grape is ever better than when fully ripened on the vine, or that the strawberry, raspberry, or blackberry is improved by keeping in storage. But, on the other hand, we all know that the pear is spoiled if allowed to pass a certain stage of maturity on the tree. What this deterioration consists in has not, so far as I can learn, ever been ascertained. The apple comes in between these two extremes. We can enjoy it in summer or fall, if freshly plucked when fully ripe, and can store our winter varieties, quite uneatable when picked, to go through a process of after-ripening in our cellars or fruit-houses.

This after-ripening of the apple has been somewhat extensively investigated. The most reliable results show that there is no increase in the sugar; that is, no new sugar is formed, in addition to what was in the fruit when picked. There are many kinds of sugar, with two of which all of us are acquainted—ordinary cane sugar and glucose. The latter is much less sweet than the former. In this after-ripening of the apple, much over half of the cane sugar was, in one series of tests, changed to a less sweet sugar, not entirely glucose, but a mixture of that with still another sugar, levulose. This was an average result obtained on twelve varieties of apple, kept six months. While some other investigators found a slight gain in sugar as a whole, all agree that the acid diminishes, and hence the fruit may in any case become sweeter. As to the sugar and acid in the pear, the changes are about the same as in the apple, so far as the very meagre investigations of the subject inform us.

Now we have reached the point where we wish to keep our fruit, either as it is, in the fully ripe condition, or in a condition somewhat short of full ripeness, till a little while before it is to be consumed; or, thirdly, in some artificially prepared form, as when dried or canned. As we all know, an immense amount of care must be bestowed on the fruit in order to keep it unspoiled, whether it be one or another of these three conditions that is to be fulfilled.

There are two general reasons for this. First, those same agencies that have worked within the fruit to produce the chemical changes involved in the ripening, a part of which changes I have briefly explained, are still in full force in the ripe fruit: ferments they possibly are, still active since nothing is done, except when the fruit is canned, to make them inactive; and their action on fruit which has reached its best stage of ripeness can be only harmful. Any change in fruit which is already at its best can not make it any better, and can only make it poorer.

Second, living organisms stand ready, great armies of them, to attack the fruit from without, settling down all over it and starting decay and rotting wherever there is a weak or broken skin. Those of you who have attended these meetings regularly have heard a good deal about bacteria; those exceedingly minute living beings which are, according to their kind, friends or enemies of the farmer and horticulturist. His friends when they help to convert all the nitrogen of dead animal and vegetable matter into nitrate, the most useful form of nitrogen-food for new plants that arise out of the ruins of the old ones that have done their work and died; his friends when, working in the growing clover, or pea, or bean, they give to the farmer or gardener the power to draw upon the unlimited stock of free nitrogen of the air, for the making of nitrogen-manure for other crops which must get their nitrogen from the soil or not get it at all; his enemies when he must fight them all the time to keep his meat, or his milk, or his vegetables and fruit from spoiling.

Nothing is safe from them, for the dust of the air is charged with them, the dust on our clothes, and on our furniture, on the shelves in our closets and cupboards, is charged with them, and they are always ready to begin work afresh whenever, in the traveling that they are forced to do as they are borne hither and thither by currents of air, they settle down on any dead vegetable or animal matter. Fruit, when once separated from its vine or shrub or tree, becomes dead vegetable matter, and therefore is open to the attacks of these unfriendly bacteria.

A short time ago an English chemist, and at the same time a good bacteriologist, undertook to determine approximately how many bacteria there were in the dust that settled out of the air under various conditions in a given period of time. This number ranged all the way from about twenty up to eight thousand on a square foot of surface in a minute of time. The highest figure was obtained in a barn where flail threshing of grain was going on, and where the air was full of dust. In a museum, on a holiday, when a large number of people were moving about, the number falling on a square foot in a minute was one thousand seven hundred and fifty; and I might give many other interesting details of the results that were obtained.

It follows from what I have said that fruit which has been exposed to the air, as is, indeed, the case with all fruit, will be liable to have bacteria on its surface. Both for proof of this, and to satisfy my curiosity as to the number of this little people likely to be found on fruit as usually exposed, I asked one of my students who is engaged in this line of study to find out for me how many bacteria there were on an apple, about as big as my fist, which I took from a basket of the fruit that had recently been left in my cellar by the grocer. He did the work very carefully, and reported 115,000—quite a good sized city on a very small piece of land one would say; and yet not much more thickly settled than a Western prairie, since it would take 400,000,000 of these beings to cover one square inch of surface. But they were there, nevertheless, scattered over the surface of this apple; some of them very probably of the kind that starts the rotting of fruit, and ready for work whenever a place should be opened, or weakened in the skin where they may begin. Beset, then, as the ripe fruit is from within, in such a manner that it cannot grow better, but must grow poorer, if it changes at all; and beset with worse enemies from without, is it any wonder that the soft, ripe strawberry or blackberry or peach, or the mellow apple or pear, is hard to keep? There is but one really effectual and practicable way to meet this double evil tendency, so that it shall be entirely suppressed, and that is to heat the fruit up to the temperature of boiling water. Thus all power for evil of the ferments working within, and of the bacteria that stand ready to work from without is permanently taken from them, and we have only to prevent exposure to air, *completely*, so that no fresh bacteria dust can come in contact with the fruit. This is the familiar process of canning fruit. *Complete* drying also stops the action of these ferments and bacteria as effectually as heat does; but really complete drying, leaving no moisture at all in the fruit, would yield a product so far removed from the original fruit that it would have little value; and if the drying is not complete, as in the evaporated apple, we must resort to other and additional means, such as cold storage, if it is desired to carry the fruit through the warm weather of the following season. This low temperature of the cold storage is of itself a means of checking the tendency to decay; for ferments and bacteria do not work well in the cold, and the latter not at all at very low temperature. But as there are limits to which the temperature must not be allowed to fall, if we would not spoil the fruit by the cold itself, this is but a partial and imperfect means of preservation. Finally, there are certain chemical substances, like borax, boracic acid, salicylic acid, sulphurous acid, which act as poisons on bacteria; but as they can be applied to fresh fruits only in such a way that harm would come to those who eat the fruits, their use is out of the question in such cases.

Therefore it is that, if we want to enjoy all the lusciousness of the ripe fruit, we must usually eat that fruit just then when it is ripe. Canned or dried, it may be good still, but it is quite another thing. Cold storage may preserve the lusciousness for a while, but not for long. Especially is this true of the berry fruits, which have only a very thin protecting skin to defend them from the attack of bacteria and consequent decay.

In the canning process we have, as already stated, the only way of preserving these tender fruits in a condition at all approaching that when they were picked; so that we are at least reminded of what they were when fresh and of the pleasant summer days when we picked them, as they come upon our tables in the midst of winter. And this is a perfectly wholesome way of preserving fruit, when honestly done, as well as an entirely successful way, so far as keeping the fruit in an eatable condition for an indefinite length of time is concerned. But there are temptations not to do it honestly, which are sometimes yielded to, and the product so obtained cannot receive unstinted praise and may sometimes even deserve severe condemnation.

The complete success of canning fruit as to the mere matter of preserving it from any further alteration, which would mean moulding and decay, requires that the contents of the can or glass jar shall be heated throughout to a temperature at least nearly as high as that of boiling water; to do this takes time and care. If a little salicylic acid is added to the contents of the can, it will so far assist the action of heat in killing all germs, that the heating need not be quite so thorough; and we find mention made in the horticultural journals of the possible usefulness of such an addition. But its use is not honest. The addition of salicylic acid to wine has been prohibited, as well as of all other preservatives, in European countries; because, while small quantities added may do no harm, there is no guarantee that if any at all is allowed, it may not be used to excess. It is not harmless when taken into the system. Fruit properly canned without it will keep perfectly; fruit improperly canned, or poor fruit canned in any way, may keep with its aid and not without; and the more careless and slovenly the selection and preparation of the fruit, and the heating and sealing of it, the more freely must the preservative be added in order that it shall not spoil. Salicylic acid is widely used

in this country in the canning of vegetables and tomatoes; probably it is also used in the canning of fruits.

Then we have two kinds of tin plates; the "bright" and the "terne." The latter contains much more lead alloyed with the tin than the former. In Germany the law requires that tin plate used for canning fruit shall not contain over one per cent of lead. In the chemical laboratory of the Department of Agriculture at Washington, the tin of some fifty cans, in which peas had been put up, was examined for lead. Thirty of them were found to contain from 1.2 up to 13% of this poisonous metal. Then, again, solder rich in lead is easier to handle than if poor in this metal. In Germany canners are prohibited from using solder with more than ten per cent of lead in it. The solder of twenty-four cans, examined in the laboratory above mentioned, was found to contain from forty-three to sixty-five per cent of lead. There is no question but that the use of lead, or of materials containing much lead, that are to come in contact with articles of food, and especially of acid food, is to be strongly condemned. And further, it is very possible that the poorer the quality of the materials put into the cans and coming in contact with these alloys rich in lead, the greater the danger of getting some of the lead, and the tin also into the contents of the cans. How far such materials are used in the canning of fruits, I cannot say, but if used so often as they are in the canning of vegetables, it is reasonable to suppose that they would often be used also for fruits.

In respect to the drying of fruit, we have again a temptation to depart from scrupulous honesty in the use of sulphur, or of sulphuring to an excessive extent. You all know that Dr. Hilgard, Director of the California Experiment Station, has for some time been carrying on a crusade against so much sulphuring. He does not believe in the bleaching any way, and calls the handsome light colored slices of dried apple "whitened sepulchres." He believes that this sulphuring may be used to cover up dirty and damaged fruit, and that fruit excessively sulphured is less digestible, because it contains so much of this antiseptic, all antiseptics whether borax salicylic acid or sulphites being unfavorable to digestion when taken into the stomach with the food. All fruit when dried darkens owing to the action of the oxygen of the air upon certain constituents of it, and he thinks that this coloration which, is in itself perfectly harmless, "should be looked for by every consumer as the natural mark of an honest, unmanipulated article." In all this I must allow that I am inclined to agree with him. At any rate, all honest men will agree that only clean and perfect fruit should be used for drying, such as needs no manipulation of any kind to cover up defects. All will agree that any form of manipulation which can be used to conceal such defects, has its dangers, as long as there are unscrupulous men engaged in every kind of business, and that where a large number, honest and dishonest alike, are engaged in the production of any manufactured article, the extensive trade in that article thus brought about may be seriously damaged by any dishonest practice; and that it is usual in such cases that a great many honest people suffer for the misdeeds of a very few rascals. Even carelessness may bring about a like result. Fruit dryers became careless in the use of the zinc trays in their evaporators, and zinc got into the dried fruit that went to Germany. It may be and it may not be, that the German government at about that time wanted an excuse for putting some obstacle in the way of the importation of so much fruit, and pounced upon this occurrence of zinc in it, as a pretext. But, at any rate, if the zinc had not been there, the chances are that they would not have been able, on any other pretext, to hurt the trade so much as they did.

But the public has acquired a perverted taste, and demands the "whitened sepulchres:" so till the public taste can be reformed, it is good business method, of course, to conform to it. But let it be done honestly, by using and insisting that all shall use only the best material, and only just so much sulphuring as is necessary to bleach it to the desired point. Mr. Green of the Ohio Experiment Station stated in a paper read before the Michigan Horticultural Society that some varieties of apples, such as the Fameuse, need no sulphuring in order to get a white evaporated product; and he would not use sulphur at all in the evaporator itself; he would merely expose the fruit to the fumes for a short time as soon as prepared for the drying. Thus he would use it, not to bleach out a dark color already formed, but as a preventive against any appearance of discoloration.

Concerning the preservation of fresh fruit a rather singular method is proposed by Monclar in a recent volume of the *French Journal d'Agriculture Pratique*. It consists simply in bedding the fruit in lime. He gives the following general statement of the results of his experiments:

1. The lime does not in the least attack the skin of the fruit, even after prolonged contact.

2. The fruit does not dry any more in the lime than in the air.
3. No change takes place in the fruit other than such as is the natural consequence of its evolution.

This method was tested on oranges, artichokes, cherries, gooseberries, prunes, tomatoes, onions, potatoes, grapes, apples, pears, sugar beets, and chestnuts with their shells removed. There was certainly no lack of variety in the material used. Not every test was successful. Tomatoes kept well for two weeks, and half of them for nearly five weeks. In another trial, tomatoes picked before fully ripe, in order to save them from an early frost, and put in lime October 22d, were good until January 15th. Pears, of a variety that he had been unable to keep beyond December in any other way, kept well in lime till the middle of April. The most interesting results, and it seems to me the most striking, were obtained with grapes. Three varieties were packed in lime on September 13th. The first examination of them was made December 22d, when all were in good condition. April 15th, two bunches of one variety were taken out, one of which was fairly well preserved, the other very well; all of one of the other varieties was in a bad condition and were removed. On May 2d the box was emptied, and all of those varieties were in excellent condition. In another trial, made in the preceding year, the last bunch of grapes in the box was taken out July 1st, when half of the berries were well preserved and had an exquisite flavor.

These remarkable statements sound somewhat romantic; but, given as they are in full detail in an old and reliable journal, they merit at least the test of experiments to determine whether the tests are reliable, and whether the method is capable of practical application.

MR. J. W. SPENCER: Can we improve the flavor of fruits by a free use of potash as a fertilizer?

DR. CALDWELL: Some time ago I desired to try experiments with grapes, and in order to do so asked for grapes to be sent for examination. Some said that was a scheme of mine to get grapes free of charge, and I was disgusted and let the matter drop. I do not think experiments are continued long enough to decide the matter. Potash combines with some of the acids and makes a combination that has no acid taste; so that it may reduce the acid and thus, perhaps, make a sweeter fruit.

MR. SPENCER, If the professor wishes to continue his experiments, the members of the Chautauqua Society will supply him with grapes.

DR. CALDWELL: I should be pleased to continue the experiments.

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## GRAPES—NEW AND OLD.

BY GEORGE W. CAMPBELL, DELAWARE, OHIO.

Among the most important events in the history of the grape in this country, was the discovery of the Delaware grape at Delaware, Ohio, about the year 1850. Its introduction and dissemination, some ten years later, made a deeper impression upon American grape growers than that of any or all other varieties which preceded it. The real origin of the Delaware is still a matter of conjecture. And, notwithstanding its small size, rather slow growth, and delicate foliage, in many places disposed to mildew, its early ripening, great beauty and unrivaled excellence, placed it immediately at the front, and gave an impulse and impetus to grape culture before unknown. The advent of this charming little grape may truly be said to have inaugurated a new era in grape growing in this country, and the interest which it awakened has never ceased, though decades of years have passed, and hundreds of competitors have vainly striven to dethrone it from its high position as the standard of excellence among our native grapes.

Closely following the introduction of the Delaware, appeared the Concord, which was first exhibited at the meeting of the Massachusetts Horticultural Society in 1853; and although its recognition was not so prompt and decided as that of the Delaware, it advanced steadily and securely in public favor, until it occupies to-day the most important position in the estimation, both of grape growers and grape consumers, as the most valuable variety for general use, and almost universal planting, yet known. We all recognize its faults or short comings;—but its good qualities, in the way of hardiness, health, vigorous growth, great productiveness, fine appearance, and fairly good quality—combined with remarkable adaptability to almost every condition of soil

and climate where grapes can be grown, justly gives it a high position, from which it cannot be easily displaced.

Many seedlings have been grown from the Concord, some of which have good reputations and are more or less planted; but none have yet superseded or equaled their distinguished parent.

The Worden, originated by Mr. S. Worden, of Minetto, N. Y., is perhaps the best of the lot, and resembles the Concord in most respects, but usually ripens a week or ten days earlier. It has very nearly the health, productiveness and vigor of the Concord; but the fruit can hardly be called better; and it has the same, or greater tenderness of skin, softness of pulp and non-keeping qualities, which render it difficult to handle and ship successfully.

Moore's Early is probably next, if not equal in value to the Worden, on account of earlier ripening, firmer berries, and fairly good quality, with a hardy, healthy and vigorous vine. It is not, however, generally as productive as either the Worden or Concord, and has smaller clusters, with larger berries. Its period of ripening—some two weeks before Concord—makes it very valuable for early market, and especially desirable for northern localities where neither Concord nor Worden mature. It seems still growing in favor, and each year to be more largely planted.

The Eaton, a still larger production, I think is claimed to be a Concord seedling. It has a strong growing, heavy vine, with large foliage, generally healthy. Clusters and berries rather later than Moore's Early, but hardly as good in quality, and is later in ripening than the Concord.

There are also several white seedlings from the Concord among the older varieties, of which the Lady, and the Pocklington are perhaps the best known and most valuable. The Lady is one of the earliest good grapes; ripening with Moore's Early. It is hardy and healthy, moderate in growth, and requires a good fertile soil, when it bears regularly and well. Its fine quality and early ripening make it quite useful for early market, and for northern sections where only early ripening varieties mature.

The Pocklington, which I believe was first exhibited in this city of Rochester, in 1877, is now largely planted and quite popular for market, and general planting. When well-grown, and well-ripened, it is large, attractive and of good quality. Vine, vigorous, healthy, hardy and productive—often inclined to over-bear. Ripens a week or ten days after Concord.

Two newer varieties of white Concord seedlings which originated in Ohio, have good local reputations, and I think they are, at least, worthy of trial.

The Witt, named for its originator, the late Michael Witt, of Columbus, Ohio, is certainly one of the best of its class, for quality; bearing full medium-sized clusters of large berries, very handsome in appearance, and ripening a week earlier than Concord. The vine makes a moderate, healthy growth with good foliage, and is very productive; but is quite difficult to propagate. It was awarded a first premium at the Ohio State Fair in 1885, for best new seedling grape.

The Colerain, also a white grape of fine appearance and quality, is in many respects similar to the Witt. The vine is of stronger growth, though less productive, and the fruit somewhat smaller. They ripen at the same time, and are much alike in quality. Propagates easily, and has been favorably received wherever tested.

The only red grape, claimed to be of Concord parentage, so far as I know, is the Woodruff Red, which originated near Ann Arbor, Michigan. In vigor, health and hardiness, I think it has no superior. It is very productive; berries and clusters of the largest size. In quality not of the finest, but seems good enough to suit the average taste, and it is becoming very popular as a market grape, especially in the south and southwest. I know that much has been said against the quality of this grape by eastern growers—and it may be, from some cause, not adapted to their soil and climate. But the demand for it has increased largely each successive year; and I have received many expressions of satisfaction from those who have successfully grown and fruited it—reporting it as selling in market at the same price as Delawares. Several persons have also assured me that they regard it as equal in quality to the Delaware. That, however, is not my estimate of its quality, though, when well ripened, I have found it to my taste, equal to the Niagara or Pocklington.

The Brighton, originated by Mr. Jacob Moore, of Rochester, N. Y., has been received with much favor; is quite largely planted, and occupies a prominent place among our standard, valuable varieties. Its healthy and vigorous growth, large and handsome clusters, early ripening and excellent quality will doubtless retain it in its deserved popularity wherever it can be successfully grown, notwithstanding some serious defects. It is not quite hardy in severe winters, without some protection. Its blossoms are imperfect, and it is consequently liable to partial failure and loose, irregular clusters, in unfavorable seasons. It cannot be called a good keeper, and does not retain its

character and fine flavor long after maturity. This admirable grape doubtless owes its fine quality to judicious crossing of its progenitors—having the Concord, Black Hamburg and Catawba, the later through the Diana Hamburg—in its composition.

Moore's Diamond, another of Mr. Jacob Moore's seedlings, said to be a cross of Concord with Iona, has been highly commended, and seems to have given satisfaction in many places. I have had it under trial since its first introduction, and find it a vigorous grower with good foliage and hardy: enduring a zero temperature with little or no injury. It is a beautiful white grape, bearing large and handsome clusters of excellent quality. Although I have it planted in several different locations on my place, it has proven, invariably, very unproductive during the four years in which it has borne fruit. I am glad, however, to say that reports from other localities indicate that this is not always its character.

The Niagara, said to be a cross of Concord with Cassady, and old and practically obsolete variety—I have found to be a strong grower, with generally healthy foliage, and very productive. Not as early as claimed by its introducers,—but attains full maturity somewhat later than the Concord,—when it is a handsome, light-colored grape, with large, well-formed clusters of good quality, and it is in many places quite popular as a market grape for general use. It will not endure severe winters without protection, and seems too much disposed to mildew and rot in unfavorable seasons.

The Empire State, another white grape, grown by Mr. Jas. Ricketts, of Newburgh, N. Y., probably a cross of Hartford with one of his Clinton hybrids, is a remarkable production, principally on account of the large price, \$4.00, for which it was sold to the late Geo. A. Stone, of Rochester, who was a nurseryman of great enterprise and intelligence. I think it has not fulfilled the expectations which were entertained upon its introduction: for, although the vine is generally healthy and tolerably hardy, and the fruit, where well-grown, handsome in appearance and excellent in quality, it seems to lack the vigor, and root power necessary to carry and mature a profitable crop to perfection. This has been my experience; and is probably the reason why it has disappointed the expectations of many who have not been able to grow it successfully.

The Ulster Prolific, originated by the late A. J. Caywood of Marlboro, N. Y., was first exhibited in 1883 at the meeting of the American Pomological Society in Philadelphia. It is a handsome red, or Catawba-colored grape, and appears to retain the favorable impression made upon its first appearance. It has proven healthy, hardy, moderately vigorous in growth, and remarkably productive; bearing its medium-sized clusters of fine flavor in great profusion, and ripening medium early, about with Concord.

The Nectar, a later production by Mr. Caywood, which was first named Black Delaware, seems quite promising, and worthy of trial, with the probability that it will be found valuable for general planting. The vine is of moderate growth, quite hardy in winter; the foliage healthy and not disposed to mildew. The clusters and berries are full medium size, well-formed and handsome; color black, with fine bloom; quality very good, and ripening with Delaware. So far as tested, has shown no tendency to rot.

The Vergennes, originated in the town of the same name, in Vermont, and introduced about the year 1880, may be mentioned as a variety that seems to have, as we say, "held its own," and perhaps has increased in popularity. The vine makes a moderate and healthy growth, and is quite productive of medium sized clusters and rather large berries of red grapes of good quality and pleasant, but not high flavor. It is among the varieties that are classed as good keepers, and which retain their flavor well after being gathered from the vine. Ripens usually a little after Concord.

The Green Mountain, or Winchell, said to have originated in the Green Mountain region of Vermont, so far as I have tested it, seems very promising for a valuable, early grape, pure-flavored, and of really fine quality. Vine and foliage hardy and healthy; bearing well and not subject either to mildew or rot. The clusters and berries are of medium size, handsome and well-formed; color, light green with white bloom; seeds, few and small. Altogether one of the most promising of the recent introductions.

The Mills grape, perhaps I should mention, as it is grown successfully and regarded as valuable in this section. I believe it is a so-called hybrid, between the Creveling and the foreign Miller's Burgundy; and it is one of the few varieties I have been utterly unable to grow, after repeated trials. I have, however, seen some fine clusters of this grape, that were grown upon the lake shore at Euclid, and also in the southern part of the state near Cincinnati. The latter, I was told, by constant application of Bordeaux mixture.

The Moyer, another recent introduction, brought from Canada, a small early, red grape somewhat resembling the Delaware, with a hardy vine, of slender growth and

good foliage, has now been grown for some years; but can hardly be said to have made much advance in public estimation. Though a little earlier, it is inferior in quality to the Delaware, with smaller clusters, which are often loose and straggling by reason of imperfect blossoms. I can see very little to recommend it, beyond healthy foliage and early ripening.

The many grapes, both new and old, which have appeared from time to time of so-called hybrid origin, I regarded as worthy of special mention, both for what has already been achieved, and for what may be expected in the future.

Allen's White Hybrid, a cross between Isabella and Golden Chasselas, originated by Jno. Fiske Allen, of Salem, Mass., was, I believe, the first of its class, and was exhibited at the meeting of the Mass. Horticultural Society in Sept., 1854, where it was regarded with much interest, and on account of its fine quality and handsome appearance, was extensively tested by enthusiastic planters, who hoped more from it than was ever directly realized.

Rather more fortunate were the hybrids of Mr. E. S. Rogers, also of Salem, Mass., reported to have first fruited in the garden of their originator in 1856. Out of some sixty or more varieties only about a dozen are now found in our catalogues, and but few of them have any very extensive reputation. Many of them have imperfect blossoms, and nearly all need protection in severe winters. Those which are still planted to greater or less extent, are Agawam, Barry, Gaertner, Goethe, Herbert, Lindley, Massasoit, Merrimack, Salem and Wilder. These succeed fairly well with a little extra attention, in all good grape-growing localities, and they are mostly of good quality, with large and handsome berries and clusters, and good long keepers.

The hybrid grapes of Mr. Jas. H. Ricketts, of Newburgh, N. Y., as grown by himself and for many years exhibited at various fairs and horticultural assemblages—notably those of the American Pomological Society—were of such remarkable beauty and excellence that they naturally excited the greatest interest in the minds of grape-growers, and awakened the belief that the finer varieties of the old world would soon be rivaled by him and his co-workers, through the agency of skillful crossing and hybridizing. Medals, premiums and high commendation followed Mr. Ricketts' exhibits wherever they were made, and seemed to warrant and confirm this opinion. Notwithstanding all this, it is greatly to be regretted that extended trial has failed to sustain the high promise of these grapes in public estimation, and few, if any, of them appear now to be regarded as having great, or permanent value. It is not because they are lacking in high character; nor because they cannot be successfully grown; for Mr. Ricketts was, by his wonderful exhibits, constantly demonstrating that *it could* be done. It may be, however, that our grape-growers are not yet educated up to the point of giving the necessary care and attention to produce the same splendid results; or, perhaps, because they believed it would not pay. It may also be that there is wanting in the grapes themselves some element of hardiness requisite to adapt them to general culture.

After Mr. Ricketts, the work of Prof. T. V. Munson, of Denison, Texas, has followed and although it may be too early to say anything positive or definite as to its importance, I believe he is, and has been for some years, doing more extensive work in striving to improve our native grapes than has ever been done or attempted by any other person. He has from time to time sent me specimens of his productions; and as they are grown in Texas, many of them are of very high character, remarkable not only for fine appearance, but excellent in quality. I can only speak of two varieties from personal experience as grown at the north, but they are now many of them offered for sale and being tested in various localities, and I think we have reason to hope that there will be found among the great number which Mr. Munson has produced those which are suited to all localities where grapes are successfully grown.

The variety named Brilliant, I have fruited at Delaware for three years. It is claimed to be a cross of Rogers' Lindley and the Delaware. It has great vigor of growth, healthy foliage, hardiness in winter and ample productiveness. Having perfect blossoms, the clusters have always been full and well-formed, medium to large, much like well-grown Lindleys. Color like Delaware, but lighter, with more red. Quality intermediate, but very nearly equal to Delaware. I have very favorable reports of its success in Michigan, and certainly regard it as promising to be generally useful.

The other variety of Mr. Munson's is one which he named, G. W. Campbell, as it was grown from the seed of the Triumph, one of my earlier seedlings. It has fruited but twice at Delaware. The vine is a moderate but healthy grower, with good foliage. It bears medium-sized, long clusters, berries the size of Delawares or a little larger; color white; quality very good—ripens a little after the Delaware.

A few words as to my own experience, illustrating some of the trials and disappointments which I have met with in endeavoring to produce new varieties of merit, by crossing the Concord and Delaware, may have some interest.

One seedling which I grew had the character of the Concord in growth and foliage; leaves thick, downy and rufous underneath, and was impervious to mildew. Clusters medium large with form and color of Delaware, similar in flavor, without any foxiness; good enough in quality to make it a valuable acquisition. But after further trial, a defect which did not appear serious at first, destroyed it. Soon after maturity, it would "shell off," leaving only bare stems; and some clusters, which I had bagged to insure perfect condition. I found all loose in the bottom of the bags. It is now grafted over, and bearing Ulster Prolific.

Other crosses of Delaware and Concord, and Delaware and Worden, produced strong vines and healthy foliage, but seemed to have retained and intensified all the unfavorable characteristics of both, or of their ancestors, with none of their good ones, and, so far as the fruit was concerned, were entirely worthless.

A later combination, still in hope of improving the Delaware, produced a vine with fine growth and healthy foliage, clusters large, with the form and color of the Delaware; flavor rich and delicate, and very nearly as good; ripening early, and berries hanging perfectly to the stems. What was the matter with this? I will tell you. It had too many and too large seeds for the size of the grape, and would be fit only for those who press out the pulp and bolt seeds and all; but as I do not eat grapes in that way, and do wish to encourage it in others, this nursling of years from which I had at one time great hopes, is relegated to that banishment where hundreds have gone before.

I have just one more of this type, which has as yet developed no fault, and still promises well; but may, or may not, be of any value, hereafter.

Some of my later efforts have been directed towards a possible improvement of the Concord, and I am happy to say, with much greater promise of success. The faults of the Concord, to which I have before alluded are—*First*, skin tender and easily broken; *Second*, pulp quite soft, next to skin, rendering handling and shipping difficult; *Third*, lack of keeping qualities—breaking down or decay too soon after gathering, or if left too long on the vines; *Fourth*, too late in ripening for many northern localities; and *Fifth*, quality not quite good enough for highly cultivated tastes. At present, I do not care to say more than that I believe I have, after many trials, succeeded in producing a variety that remedies all these defects and at the same time retains all the good points of the Concord, in vigor of growth and health of the vine and foliage.

There are many more varieties, which I might comment upon and some of which may have greater value in certain localities than these which I have mentioned. But I have mainly spoken of those with which I have had personal experience. I recognize, also, the principle that there can be no practical benefit in multiplying and introducing, or recommending new varieties, unless they have some important characteristic or excellence above those which we already possess.

The time has passed when the mere fact that a variety is a new seedling or hybrid is sufficient to commend it to public favor. And I believe there are many grapes, which might with advantage be left out of our catalogues—and I think this will be done at no distant day, with no loss to our nurserymen and with decided benefit to their customers.

In reference to my comparatively unimportant efforts in producing new varieties to which I have before alluded, I can say that I have conscientiously worked upon the lines of rejecting all which did not prove in some important respect better than any others yet known; and although hundreds have been thrown away in carrying out this determination, I still have an abiding faith, resulting from my experiments, that progress will continue through the agency of skillful and intelligent efforts by growth of seedlings; by crossing and hybridizing; combining, selecting and re-combining; and although it may be slow, will eventually result in substantial, and as nearly perfect success, as man can reasonably expect to achieve. And if I could live my seventy-seven years over again, or the half of them—I would still continue my labors in this field, notwithstanding its many discouragements and disappointments, never doubting that I could make some valuable advancement worthy of the efforts which I would gladly make in this interesting pursuit. And although I may not live to see it, I believe the time will come when we shall have, through the efforts of our enthusiastic experiments, grapes for all useful purposes, and suited to all sections of our country where the vine will grow and flourish—that will be second to none grown by any other nation or country upon earth.

## THE ART WHICH DOES NOT MEND NATURE.

BY HON. CHARLES W. GARFIELD, GRAND RAPIDS, MICHIGAN.

The object in the selection of this topic is not so much to indicate what it shall cover as to form a sort of clothes-line, upon which can be pinned a number of articles in the form of criticism and suggestions upon subjects that are quite diverse, and not arranged in logical order, but having one common factor.

Step with me, for a moment, to the border of the average city or village cemetery, and note the methods in which the so-called embellishments of the grounds, in the form of trees and shrubs, plants and flowers, have been handled. See how trim and accurately pointed are the forms of the Junipers and Red Cedars, scattered here and there over the premises. Note with what precision the shears have been employed in forming the oval, globular or pyramidal heads of Norway Spruces. Just see how the native drooping habit of the Hemlocks has been metamorphosed into a stiff geometrical form. Here and there a lot has been enclosed by a hedge that has been pruned into the rigidity of right lines. Cast your eyes upon the triangles, rectangles, circles and ovals of the flower beds that adorn the individual graves. Even the shrubs, the distinctive character of which is due to the individuality of leaf and branch, have been cut to one model. There is a stiffness and unnaturalness that makes one feel as if he were out of place except he is arrayed in swallowtail coat, choking collar and silk tile; and still, some of Nature's most beautiful forms, most attractive creations, have been taken in the name of adornment and shorn of the very elements of attractiveness, in order to bring about this condition of things that seems to be concomitant with the term "city cemetery."

I wish to enter an emphatic protest against this misuse of the beautiful creations of Nature, and to suggest if cold, stiff formality is to rule, that granite and marble be employed exclusively, and that the delicate live things that naturally, if left alone, assume beautiful proportions and delicate forms, be excused from forming any intrinsic part of such an environment, after being shorn of all those attributes that render them attractive to people of taste. I find men all over the country in charge of these places (which should be, because of their association, made quietly beautiful), even calling themselves plantmen and horticulturists, who are entirely lacking in every element fitting to these employments. Ought not our horticultural clubs and societies devoted to progressive horticulture, to give utterance in no feeble way to their protest against these outrages upon the professions they are engaged in developing and elevating.

The professional tree-pruner counts himself an artist in his way. Upon various theories and hypotheses, with shears and pruning-knife and saw, he modifies the forms of trees to accord with his artistic (?) notions. The grounds of many people who have been willing to expend money without stint in the embellishment of their premises, bear witness to the presence of these men who are in the constant practice of the art which does not mend nature; men who have never heard of a tune that was pitched to the key of B natural. To them there are certain ideal forms to which all tree life must conform, and every specimen, no matter what its own tendencies may be, must be brought into line with one of the forms in their list.

This is especially true in the treatment of Evergreens. With the ostensible purpose of thickening the branches, of beautifying the outlines, of shaping the tree, they eliminate all the natural beauty and individuality of the specimens. The only morphology they know anything about is found in the regulation figures that adorn the pages of a geometry. I cannot express too strongly my lack of sympathy with this devotion to the shearing business.

A gentleman of my acquaintance, whose life for years had been devoted to the destruction of trees; whose ideal value in a tree was to be calculated by the distance from the ground to the first limb, bought him a beautiful place upon the front of which there stood two magnificent specimens of the White Pine. They had been planted rather too closely together in the beginning, so that at the date of this purchase, each was intrenching upon the domain of the other, and both obstructed the view from the favorite window of the mansion to the highway. One could have been removed leaving an open vista from the window, and the other would have developed grandly in proportions, and given an individuality to the place that would have even suggested a name as connected with the tree. But what did this dealer in lumber, laths and

shingles do? He trimmed them both up from the ground so that a view could be obtained beneath the branches, to the permanent destruction of all that was beautiful and attractive in both trees. In later years, notwithstanding some attractive features have been added to the grounds, the inexcusable mutilation of these noble trees is such a blemish as to detract from whatever else of value has been or may be added.

An excuse is found, sometimes, for cutting in the branches of trees, because the owners in planting them had forgotten that,

"Art is long and time is fleeting."

and placed them too near a building or other trees. In rare instances this sacrifice may be excusable, but usually it would be better art to remove the specimen than to sacrifice its individuality. Even the average deciduous tree that may adorn the lawn, like the Norway Maple, Scarlet Oak, the Linden or the Sycamore, if given ample space in which to grow, will derive an added beauty from the privilege of throwing its branches directly from the ground; and it is the exception, as in the case of the American Elm, when a lengthy naked bole adds to the beauty of the specimen. An instance here occurs to me, in which delicate sprays of foliage which relieved the bareness of the trunk of a magnificent Rock Elm were entirely removed at one fell swoop of the sharpened blade of a professional pruner, accomplishing for the tree what a barber would for a man by shaving off his eyebrows.

Instances of this kind have taught me to fight shy of the men who from long experience in the "old country," know just how to make fine models of your trees. Years ago, in the establishment of the Agricultural College of Michigan upon the site selected, there were scattered Oaks of various species, White Woods and Elms. One of the first improvements made to the grounds was to saw off the tops of all these trees. The first time I visited the grounds, a mere lad, in the same carriage with Dr. Wayland and Prof. Olney. I was greatly struck by the diverse opinions of the two men, with reference to the future of the institution, the former advocating a bright promise of great usefulness in the development of the agriculture of the state, the latter questioning seriously if there was really any call for that kind of a thing.

The argument was waxing warm, and as we approached the grounds, the decapitated tress, in all the ugliness of their shorn beauty, hove in sight, and Prof. Olney remarked with scathing irony; "Lo! behold the triumph of agricultural art! If this is the beginning, what may we not predict for the end;" and Dr. Wayland's only way out of it lay in the incident of a self-opening gate throwing out its wings before us with no apparent motive except to bid us welcome, and he remarked: "the triumph of mechanics is demonstrated, at any rate."

A generation has passed since the spoliation of those magnificent trees that had occupied the attention of Nature so long in the perfecting of their grand and noble forms. The work of decay thus invited, secured their humiliation, and one by one, they have dropped out and there is scarcely a remnant left of what ought to have been the characteristic feature of the campus. Illustrations of abuses like this will occur to you all.

The spirit of better roads is in the air. A perfect road-bed is greatly to be desired, but once securing this, it is just as important to render the highway on either side attractive to the traveler and pedestrian. Two things people seem to know about this subject; and judging from manifestations, these two things are known to the exclusion of every thing else that is valuable: *First*, that the natural growth that may have adorned the highway must all be removed; and *Second*, in its place must be planted at exact intervals, trees in right lines, of every shape and uniform contour. To accomplish this and to maintain the balance of root and top, and inasmuch, as most of the root has been removed, the part above ground of the newly planted tree is reduced to a truncated stick.

Against this method of highway adornment I wish to enter my emphatic protest. It is often true that through the removal of the road fence in accordance with the spirit of these later times, the very elements of the most perfect embellishment of the road side are to be found in the growth that has been protected by the fence. Let me cite an example. Along the eastern border of my farm originally there was no highway. It was a line fence between neighbors, and because it was on the line and erected in the early days of pioneer farming, when the matter of greatest import was to secure enough from the soil to make both ends meet, the native growth of tree and shrub and vine was given the utmost license. It transpired in the course of a generation that a highway was laid upon this line. The fence, once removed, revealed the line of sylvan growth with artistic natural groupings rarely seen anywhere. The shrubs and vines and wild beautiful things that grew at the base of the trees were

sacrificed at once as mere rubbish, and only by dint of hard fighting on the part of my father, and the maintenance of the battle on my own part, have we preserved this natural grouping of trees, a half mile in length, which to-day is the most beautiful feature of our neighborhood. If all of the growth could have been preserved, nothing could equal it in the way of adornment for a highway, for the satisfaction of the lover of shade, the artist, the school children that daily pass it, or the stranger who might visit our region. Scattered over the country everywhere we can find examples of how beautiful the roadside could be adorned by the saving and continued protection of not only the Oaks, Elms, Basswoods, Sycamores and other native trees that have sprung up there, but also the preservation of the Dogwood, Hazel, Wild Roses, Winter Berries, and Thorns, with here and there bunches of Asparagus that have grown up at their roots, and form a rare mantel of embellishment; and then, if instead of pulling out every snarl of climbers, there can be saved the Grape Vines, Virginia Creeper and Bitter Sweet that have entwined themselves among the branches, and in many cases almost cover, the trees, an added enjoyment can be given every lover of beauty who passes by. Why must we allow the despoiler to have such sway throughout our country? Why can't our horticultural societies, which have claimed to have done so much in the education of the people, allow this important matter to take a prominent place in their methods of education?

Possibly I may err, but it seems to me that we are living far below our level of proper influence if we, without a protest, allow in our public parks and even upon private grounds, the monstrosities of forms created in trees and with plants and flowers to be leading features of the improvements.

What satisfaction can there be in so metamorphosing a vigorous growing tree, and showing our control over its energies, as to make an elephant, bird or fish out of its transformed branches and foliage? There is no beauty in it, and no satisfaction, except to illustrate how much grief a poor tree can bear. To me the operation seems as foolish as that of pinching a Chinese woman's foot or crowding an American woman's ribs, in the interest of false notions of what is beautiful. It is a degradation of beautiful things, to use them in the development of such unartistic elements of adornment; and when park boards and distinguished foreign professionals make these monstrosities leading features of their art, Nature is not mended, but sacrificed.

In this connection I desire to mildly exhibit my dislike for the attention that florists give to the exhibition of flowers upon metal forms. There are, without doubt, great occasions in which formality is the leading factor, where the representations of various material things can be made in flowers and be tolerated, but the display upon every available opportunity of elaborate forms representing every thing from a ship at sea to the gates of heaven, seems to me an utter degradation of the most delicate things Nature produces.

It is without question a commendable development of art to bring out a new form of flower, or to add to the variety of tints in which a species may be shown. This is the utilization of Nature's law under the control of men, who have learned how to interpret them in such a way as to add to the beautiful things in the world. But to take these delicate creations of Nature and mass them, so as to eliminate their individuality, into the forms that illustrate at most a little mechanical genius, has not the semblance of art in it. A graceful arrangement of flowers, taking advantage of the laws of appropriate combinations of color and form, is a form of artistic work eminently desirable to develop and magnify; but the average florist's hand bouquet made in precise geometrical lines, with flowers having scrippled stems pieced out with tooth picks; or the marriage bell remarkable simply for the number of white carnations used in covering its framework; or the funeral pillow, the creation of which is suggestive of nothing to relieve pain or soften sorrow; the floral representation of the beautiful gate's ajar, or gate wide open, are not symbols of a highly developed taste in artistic effects. We can afford to reduce them, by our influence and example, to their lowest terms, and develop a wider employment of rare floral forms for their own sake, as accompaniments of joy and sorrow, and in the adornment of the person, as well as the places that we wish to beautify.

I have another article or two to hang on my line, and if you do not deem it improper, I desire to mildly criticise the efforts of those good people who think to add to the attractiveness of their exhibits of fruits and vegetables by devoting a good deal of time to "shining them up." There is nothing that renders the apple, or peach, or pear, and especially the plum and grape, so particularly attractive, as the native bloom that adorns its surface. It is quieting to the eye, it adds dignity and modesty to the fruit displayed, it is a serious loss to remove it. Why do we tolerate in exhibitors the habit of removing Nature's delicate adornment of our fruits?

The most noticeable feature in that magnificent display of grapes made by the state of

New York, at the World's Columbian Fair, was the marvelous care in the handling, which resulted in the perfect preservation of the bloom upon every cluster. The shiny surfaces of most of the potatoes shown at the Fair were examples of the unwisdom of following the pernicious practices of polishing the surfaces. The habit should be condemned.

And now a last word about the display of culinary art in despoiling fruits of their distinguishing flavor in fitting them for the palate. Is it just the thing to do, after we have expended all our energies in fertilizing the soil and cross-fertilizing the blossoms, and have given the highest cultivation to produce in a strawberry the most delicate flavor, to stamp out every vestige of that flavor by smothering the fruit in cream and sugar? Is it just the proper thing to take our fruits as we have developed them, which afford us a wide range of delicious flavors, to so manipulate them in the process of canning as to render it impossible to distinguish one variety from another, or even one species from another, because of the use of rich sucrose syrup, in which they are enveloped? The suggestion, perhaps, is sufficient.

There is a grand field for man's noblest endeavors in weaving into attractive combinations the elements of beauty and good taste which Nature provides as working material, but our forms and originations must always acknowledge Nature's own supremacy when at her best, or else that which we aim to make a model of attraction shall appear only as an excrescence on the bosom of the earth. He who cherishes a desire to gain laurels in the art that does mend Nature, must himself live near to Nature's heart.

Mr. L. B. PIERCE (Ohio) thought there was a middle ground in the matter of pruning evergreens. Only a day or two before, he had been a visitor at Dosoris on Long Island, and spent a half day with Mr. William Falconer in looking at the beautiful evergreens of a hundred different varieties that were growing around the home of Charles A. Dana. They were all kept within bounds by cutting back the leader two-thirds and allowing a new one to form from the uppermost bud left. The end bud of the leading shoots of the upper third of the trees was pinched off just after commencing growth in the spring—any straggling shoots below were pinched in the same manner. The trees made a thick, rank growth, and were oblate-conical in form. They were annually manured in the spring with the stable manure that had been scattered on the lawn during the winter. The trees were in this way kept within bounds, and at the same time lost none of their beauty or characteristic traits. At the best, evergreens only preserve their highest beauty for a short time, and when we talked about natural beauty in the evergreen, we could only refer to the brief period of its youth, for, with very few exceptions, most evergreens left to nature's ways, outgrow their beauty in a few years.

Mr. D. R. RHIND of Canandaigua said that circumstances alter cases; many trees were out of place if left entirely to themselves on a neatly-kept lawn. On a lawn kept closely mowed and dotted with flower beds, big, shaggy evergreens were out of place; trimmed to a certain extent, and kept low down on the lawn, they made an excellent back-ground for flower beds, and were in accord with the general beauty. A flower-bed under a huge spreading elm would be out of place, but close beside a nicely trimmed evergreen it was appropriate and could be made very beautiful.

## ARE NOVELTIES WORTH THEIR COST?

BY PROF. L. H. BAILEY, COLLEGE OF AGRICULTURE, CORNELL UNIVERSITY.

It is a perennial question, this asking if novelties in fruit pay; and yet it is never settled. The manner of answering the question seems always to be the same; the respondent cites his own experience with the new varieties, with an inclination to dwell most upon those which he considers to be dishonest or unworthy; and so it comes that there are as many opinions of the "novelty question"—as the discussion has come to be called—as there are persons who try to answer it, with a tendency, always, to decry the introduction of new things. It is evident that the fundamental merits of the question can never be determined from individual experiences of a certain number of novelties, for it is rare if any two experiences agree upon even the same variety. If there is not some broader and scientific basis of judgment, the question may as well be dropped forever.

What we really need to ask is this: Is there a constant tendency for new varieties to surpass the old? Or, in other words, have we yet reached the limit of improvement

and evolution in any species of plant? Before attempting a direct answer to these questions, we shall need to consider for a moment if varieties are pre-limited in duration, or if they "run out;" for if they do pass away, new varieties must take their places, or the cultivated type of the species would cease to exist. Or, to state the proposition differently, if varieties run out, the species can be rescued from oblivion only by new forms; but inasmuch as all valuable cultivated plants tend constantly to increase in extent of cultivation, it follows either that they do not run out, or that new varieties are better than the old and drive them out. And yet, there are persons who hold tenaciously to both dogmas,—that varieties run out, and that novelties do not pay—without seeing that the logical result of such opinion is to drive the cultivated flora from the face of the earth. Now, it is true that the varieties of any plant are, as a whole, constantly changing, as one may prove by comparing the catalogues and manuals of a generation ago with those of to-day. These changes are most rapid in plants of shortest duration, or those in which there has been the greatest number of generations, showing that the greater the opportunity for renewal of stock, the greater is the variation and number of recorded varieties. Thus, the apples of to-day are as much like those of a century ago as the strawberries of to-day are like those of ten years ago; and there is about the same number of generations in the one case as in the other. This means, as I said before, that the rate of change in named varieties is in proportion to the length of life or profitable duration of the species. This at once raises a strong presumption that varieties do not wear out from mere age, but that they pass out in the process of reproduction or regeneration; and, as varieties of standard merit are more numerous in all plants now than they were a century, or even a human generation ago, it must follow that new varieties have been appearing all these years which were good enough to obtain the confidence of all careful growers. In two papers which I have presented to this society, I have shown, I think, that varieties do not wear out; but all plants which are habitually propagated by seeds, as garden vegetables and flowers, tend constantly to change or differ from their parents, and finally to pass so far away from them that they receive new names; and plants which are propagated from cuttings of abnormally developed parts, as the potato, constantly tend to deteriorate, unless grown and selected under the very best conditions; but all plants propagated from normal or unvariable parts, as by ordinary cuttings, cions and layers, remain substantially the same from century to century, as is the actual case with several prominent orchard fruits. If the orchard fruits do not run out, therefore, the only reason why the varieties should change is because better ones appear and drive them out; and inasmuch as it is a matter of common knowledge that change does take place, it follows that profitable novelties have appeared.

Up to this time, therefore, novelties, or at least many of them, have paid. Is there any reason for supposing that they will not pay equally well in the future? Or, to raise my original question: Is profitable variation no longer possible? This question is not new, and there is no special reason for asking it at the present time. It is certainly as old as commercial horticulture; and, for all I know, Noah, when driving the animals into the ark, may have asked if so many varieties paid. If novelties have furnished all advancement up to the present time, it would seem that they must continue to do so in the future; and the only reason for discussing the question at all must be a prevalent belief that varieties are now so many and so good that the limit of profitable evolution has been reached.

I have said that all advancement in types of cultivated plants has come about through the origination and introduction of new forms. It is necessary, then, that this advancement be defined. A novelty does not necessarily need to surpass every or even any old variety in order that it may have merit. It may possess attributes which fit it for some entirely new condition or use. A currant or gooseberry which is sweet and tender enough to supply the dessert may be a useful novelty, while in all other respects it may be inferior to all existing varieties. And this is a point that we should keep constantly in mind,—that we need new varieties for unfilled gaps, for new regions, various soils, new markets and new household uses. If, therefore, a variety is successful, or profitable, with one person only, and fails with all others, it is worth introducing. The trouble is not so much that novelties are unworthy, as it is that they are recommended promiscuously and that their particular and distinctive merits are not discovered. Now, I like to think that the evolution of cultivated varieties follows the same laws as the evolution of new types in nature; and it is pretty well agreed by all naturalists that there are more distinct species or forms upon the earth to-day than there have ever been at any one previous time. We are apt to think that both the animal and vegetable kingdoms have passed the zenith of their development, because the great number of monstrous forms are now extinct. There were giants in those days. But size or bulk is not a measure of the height of development. Evolution

is perfected only when every phase and condition of the external world has some type of life particularly adapted to it; and inasmuch as new conditions in the physical features of the globe are constantly appearing, there must be a constantly progressing attempt on the part of animals and plants to adapt themselves to these new conditions. The surface of the earth was probably never so varied in physical characters as at the present time, and it is safe to assume—particularly as such facts as are known support the assumption—that there has never been so many diverse forms of life upon the globe as at present; and this differentiation is proceeding as rapidly to-day, probably, as it has at any time in the past. In other words, the only limit to the expansion and evolution of wild plants is that of the surroundings in which they live; and as cultivated plants modify themselves through the same laws, it must follow that there is no predetermined limit to their amelioration or improvement, as long as man continues to cultivate and modify the earth. Every year may witness better varieties until the plant becomes so unlike its ancestors that its parentage may be lost or unrecognized, and new specific forms, even, may originate under the hand of man; and this has actually occurred in many instances.

If philosophy teaches us that there is no set or predetermined limit beyond which plants may not progress, reflection must likewise convince every one of us of the essential truth of the same proposition. We know that most important cultivated plants have come from a very inferior ancestry; and some, if not most fruits have sprung from parents which are scarcely edible to cultivated tastes. And we have a graphic means of comparing the improved side by side with the inferior types in the small-leaved, small and austere-fruited and often weak and tender "crabs" and other seedlings, which, however, are only partially reverted to their aboriginal condition. And in America, where vast new regions have been settled with great rapidity, we have seen the extension of fruit growing, by means of new and adaptive varieties, into regions which were thought to be unfitted for such purposes but a few years ago. It is a fact that all plants, especially our fruits, have responded with really remarkable facility to all the new demands which our markets and soils and climatic limitations have placed upon them. This response has been in the way of new varieties, and it has, of course, been most marked in those fruits which were comparatively little developed and to which almost every condition of cultivation and dissemination was new. You will recall the readiness with which the native plums, within forty years, have given us nearly two hundred varieties adapted to a remarkable range of conditions and uses; and the blackberries and raspberries within a generation have given results which show that they will equal, if, indeed, they do not eclipse, the wonderful evolution of native grapes within a century; and many of you will recall the fact that it is less than a generation ago when it was thought that roses could not be successfully grown out of doors in this country. Evolution, therefore, undoubtedly becomes slower the more the plant is improved, for it has constantly to compete with its own progress; but if worthy new varieties are less frequent in the old standard fruits, it does not follow that there are none.

I assert, therefore, that the tendency to produce new varieties is the means by which cultivated plants are ever more and more improved and fitted into new conditions and uses; and novelties must pay if horticulture is to forever pay. But not all novelties pay, and the reasons must be apparent. They may not be good enough to pay. Novelties are introduced both hastily and indiscreetly. If the philosophy of the question, as we have considered it, teaches us anything, it is: First, that the older and more improved the type, the less are the chances of securing a worthy novelty; Second, that there is most use for novelties in those plants which are propagated by seeds and by abnormally developed parts, because such plants usually quickly run out by variation; Third, that worthy novelties appear less frequently in old regions than in new ones, because of greater competition of established varieties there; and Fourth, that the merit of a variety lies in its adaptability to some particular use or demand. I therefore look with caution upon novelties in the old standard fruits and in the old horticultural regions, the more especially as these fruits are propagated by buds and the good old varieties remain with us; and I look with suspicion upon all those which are recommended indiscriminately, indefinitely, generally, and for everything and equally for all regions, because their descriptions cannot be truthful and cannot be founded upon experience. I believe that the time is now at hand when a man can establish a more lucrative nursery or plant business by giving his novelties careful and discriminating tests and by telling what they are not good for as clearly as he tells what they are good for, as he can by possessing himself of the desire to introduce a certain number of novelties each year and to paint them in such faultless colors that every thoughtful man knows that they are false.

## COLD STORAGE FOR NEIGHBORHOODS.

BY C. H. PERKINS, NEWARK, N. Y.

For some thirty years the writer of this paper has been personally interested in the growing of apple orchards, in nursery stock and in the buying of apples. The business has included orchards in Kansas and Michigan, also the exporting of apples from Western New York to Europe.

By the term "cold storage" I have not meant to imply the great storage houses in cities and other points, where the temperature, by means of ice or chemicals, is kept and even contracted to be kept at a certain point for months, where thousands of crates of eggs, carloads of beef, and even ship-loads of fruits, are held and distributed to the trade as they may be wanted; neither do I mean that system of cold storage used and employed by the eight or ten large canning factories located in Western New York, where immense amounts of Bartlett pears and other fruits are held for months for canning purposes (a low estimate of Bartlett pears alone, held some years, would not be less than fifty thousand bushels).

The idea of this paper is, that neighborhood cold storage may be run in some of the details and on about the same principles as those of the coöperative cheese factories of the great dairy counties of this State, where, thirty or more years ago, every individual dairyman made his own cheese, and the result of that system, which had been in use years and years, was that there were as many grades, brands, qualities and sizes of cheese as there were individual farmers, attended with all the different details of making and selling the thousand and one different productions and brands. Then came the coöperative system of cheese factories, by which the dairyman only contracted to furnish the factory with the milk produced by a certain number of cows. As far as the dairyman was concerned, all the details were done away with; instead of numerous brands and qualities, one uniform quality was insured, the brand of the factory becoming well known and found worthy, the natural result was that it was sought after, and instead of, as formerly, so many small lots being sent to the large cities to be sold as best they could, the buyers came to the doors of the factories, and now it is no unusual incident for buyers from Liverpool or London to be in the markets of Little Falls or Utica, and often favorite brands are shipped direct to Europe from the factories, and the enhanced value more than covers the cost of manufacture, and the relief to the dairyman, and to his wife, from the care and details of the old way, is beyond estimation.

Naturally, one asks what necessity for coöperative storage for apples in barrels, and what particular advantage will accrue to the grower? The grower of apples in Western New York has only to cast his eyes about him to perceive that he is being surrounded, and that in the very near future market he has depended upon will be wholly or in part monopolized by his Canadian and Western neighbors. Besides, another factor is looming up, larger and larger, as the years go by. It is said that a conservative estimate of the oranges to be shipped this season from Florida is not less than seven thousand to ten thousand carloads; that the crop of oranges in California will exceed five thousand to seven thousand carloads; add to this the importation from the Mediterranean, and let it be understood that the consumption of oranges, to a certain extent, comes in direct competition with that of the daily use of apples. Will the apple orchardists of Western New York go with me and see what our Western neighbors are doing? In 1890 I had occasion to spend a good part of the months of September and October in Missouri and Kansas, buying the dried fruits (not the barreled apples), the productions of the orchards of those states. I found one orchard in Kansas with an out-put of twenty thousand barrels, besides all the drying and cider apples. I found one orchard near Springfield, Mo., that the net income was sixteen thousand dollars, and plenty of others that the income from them ran from five thousand to eight thousand dollars. This last season, traveling in Michigan, I found one section where, for twenty-five miles long by eight miles wide, the farms were solid blocks of fruit. You would hardly see a vestige of any other production than that of fruit. Great, double-decked wagons, with three to six horses or mules, were hauling the fruit to the market, and it was being distributed all over the Northwest. Then think that from New England, from Maine to far west of the Missouri river, this planting of apple orchards has been going on from year to year. Should all these orchards come into bearing and produce even a fair or small crop, with present methods of marketing, would the fruit pay the cost of harvesting to the Western New York grower? But we must not forget the great increase of our population, the enormous growth of our cities and villages, the immense export demand for our apples for the markets of Europe; also that, scattered

all over the country, but especially in Western New York, the many hundreds of evaporators that afford a market for a great amount of apples (it has been estimated that in an average year the value of evaporated apples in the county of Wayne alone, is not less than one million dollars); add to the above the thousands of cars of cider apples consumed by the eight or ten great mills located in New York state, that produce pure cider vinegar, and also sparkling cider for a beverage. If, therefore, every neighborhood in Western New York had a cold storage house for barreled apples, that would protect against frost and hold anywhere from ten thousand to twenty thousand barrels, run, if need be, on the same coöperative principles and methods as the cheese factories of this state, or the fruit associations of California or Michigan, would not the result be very much more satisfactory to the grower than present methods? Would not the season of marketing be extended from October to April? Would not the fearful glut be a "back number," a matter of the past? Would not well-packed apples, carrying a well-known brand, a guarantee of honest worth, be sought after? And would not buyers from Europe and our large cities come to our own doors, the same as they do in the cheese markets of Little Falls and Utica, and in the prune, apricot, raisin and orange markets of San Jose, Fresno and Riverside?

Such a building may be of moderate cost and yet substantial and durable, and it need not always be located at the nearest railroad station. How many have ever figured or thought of the cost to the grower, of transporting his apples to the railroad or canal station, from his farm during the months of September or October when there is much work to do and time is of most value? Say the grower is five or eight miles from said station, I believe that for less cost per barrel the dealer located in Western New York will deliver the same apples in barrels at Chicago, Milwaukee, Duluth, Philadelphia, New York or Boston.

To return, there are quite a number of apple houses in Western New York owned by dealers, but there are few that were built for the express purpose of safely storing apples. I have a building that I built for the storage of nursery stock, and in which I have had apples stored all winter. It is frost proof, built on a heavy stone wall twenty-four inches thick and three feet high. On this wall were set up 2 x 4 scantling; these were sheathed with inch hemlock then covered with tarred building paper; then furred out with strips four inches deep and again covered as before, until the wall has three air spaces; the roof is constructed in the same way to protect against frost; light and ventilation come from two rows of windows at the top; the roof is gravel; the outside is covered with novelty siding; the building has double or two sets of doors at each end and a driveway through the center; it is painted inside and out; it is one hundred feet long by forty feet wide; the whole cost was one thousand four hundred dollars and it would afford storage for ten thousand barrels; the atmosphere is the same inside as out, only that the building is frost proof and can be run in the winter months with a variation of not over twelve degrees; there is no smell of a cellar whatever and stock always keeps perfectly.

Such a house, or a better one, in a neighborhood would pay, four years out of five, at least fifty cents a barrel over all costs of labor for handling, sorting, insurance, etc., and this year, where there were apples, it would have paid one dollar to one dollar and fifty cents per barrel. Some of us have thought, when we considered the immense planting of apple orchards, the thousands of carloads of oranges that Florida and California can supply now, with the prospect that a few short years will increase that production, until the retailer will supply your table and mine with the best of oranges at a cost not to exceed one cent each, that the days of a profitable apple orchard were numbered. But let us consider this competition. In all the great markets of the world a good red apple brings more money than an orange. In London you pay fifteen to twenty cents for an apple and a few pennies for an orange. Florida imports buttermilk and kerosene oil from the north to kill the scale on her orange trees, and California covers every individual orange tree with canvass and then fills the canvass with a certain gas to kill the Australian scale. It is said that there is not one orange orchard in Florida aside from the few on hammock lands, that pays a profit and until the Nicaragua canal shall be built, the overland transportation will wipe out the profit to California orange growers.

It was my fortune a few years ago, while investigating a bee or honey ranch in California, to stand on one of the foot hills. Back of me the San Bernardino mountains, snow-capped, rose twelve thousand or fourteen thousand feet before me, the canon I had climbed was covered with live oak; but out on the plain beyond, were the gardens of oranges, lemons, apricots, olives, and the broad Pacific in full view beyond; I thought of the tales I had read of the gardens around Grenada in Spain, and wondered if anything could be more beautiful? Again, I sat on a fence in the valley of the Kaw river in Kansas, between Lawrence and Topeka; before me on an eastern slope stood

four hundred acres of Wine Sap, Missouri Pippin and Ben Davis, all red apples; the trees were low headed and the limbs touched the ground with their burdens of fruit; two hundred men were at work. The production had been sold for sixty thousand dollars for the barreled apples and some ten thousand dollars for the dryers and cider fruit. Just beyond and belonging to the same orchard, were eight hundred acres not yet in bearing, twelve hundred acres in all.

I have not changed my mind, that if our apple growers will take care of, feed, spray their orchards, and market their fruit in a business like way, taking advantage of, and making use of any new and better methods than those which their fathers followed, that they will find their profit and loss account a very satisfactory one.

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## THE CONSERVATION OF WATER FOR GROWING CROPS.

BY PROF. I. P. ROBERTS, DIRECTOR OF COLLEGE OF AGRICULTURE, CORNELL UNIVERSITY.

Water carries all of the food of plants and animals into circulation and all excreted material out of circulation, so there cannot be abundant growth and vigorous healthy life, without there is an abundance of water always present in the tissues of growing organisms. Most living plants contain from seventy-five to ninety-five per cent of water. Notwithstanding the great need of plants for a liberal supply of water, yet, the soil may easily contain so much as to injure or even destroy them.

For carrying off a superabundance of water, in all ordinary cases provision may be made by means of surface and underground drains, but the problem of supplying water cheaply to plants when there is a lack, is a difficult one.

In most localities in the Eastern and Middle States surface irrigation is found to be not only impracticable on account of lack of water, but also because on many soils surface-irrigation results in injury to the land. Clay lands unless most thoroughly under-drained become puddled, sour and reduced in productive power when surface-irrigated. Only on certain classes of soils, usually found in arid countries, does surface-irrigation become fully successful. Sub-irrigation is the ideal method, but it is so expensive that it can come into use only where large amounts of very valuable products can be secured on small areas.

With few exceptions all cultivated plants have to depend on the water stored in the soil. How to make a great storehouse for water in the soil without saturating it, and how to get the water near to the surface for the use of the plant without letting it escape during dry weather become subjects of prime importance to every plant grower.

It should not be forgotten that water moves up hill as easily as it does down: that is to say it obeys the strongest force; if it were not so the oceans and lakes would soon overflow the land. Parenthetically, I might say that in the early period of the earth's formation the water moved *uphill so persistently that it covered the whole face of the earth.*

An acre of soil one foot deep will weigh about one thousand six hundred tons, and may contain when in good condition for growing crops thirty-two per cent. of water. This is equal to five hundred tons or four thousand barrels per acre. If the soil is too compact or too loose not more than half this amount, sometimes not more than one-quarter will be contained in the interstices or pores of the land. Soils vary very much in their power to hold on to water without being saturated. A friable clay loam has the power of storing water to a much larger degree than heavy clay or loose sandy soils. Heavy rains in the fall and spring tend to puddle the land, that is, fill the interstices which are between the particles or molecules of earth, thereby diminishing to a great extent the storage capacity of the land. Often about the only object of deep culture is to overcome the effect produced by heavy beating rains and to enlarge the capacity of the soil for holding on to moisture. We find then that there is a large amount of water stored in the first twelve inches of the surface soil, and we know that a large additional amount is found in the sub soil; in some cases it is far more than is found in the surface soil, although usually that is not the case.

The question arises how to make the best use of and how to conserve this stored up water, which finally contains all the fertilizing material which enters into the circulation of the plant? *Thin seeding* assists very materially in the conservation of moisture. Plants usually suffer in the middle and latter part of the summer when they are trying to produce fruit. If too many plants are growing upon the surface, the land

will already have been robbed of its moisture, before the fruiting season, and a failure to produce satisfactory seeds and fruits is inevitable.

Another method of conserving moisture is to shade the land, and if this is done with growing crops as clover and the like, the amount of water which is evaporated from the leaves is greater than that which is conserved by the shading. So where the object is to conserve the moisture for the tree when it is fruiting, it is not wise to have growing crops in the orchard.

Mulching of the soil with straw or other coarse material cannot be practiced in any large way, so although valuable, little dependence can be placed on this method. In bearing orchards it should be done if at all about the last of June. The conservation of moisture by surface culture has been found to be eminently successful. The enlarging of the capillary tubes at the surface prevents the water from rising, also shades the land and keeps it cool, thereby preventing to a large extent surface evaporation.

Some experiments conducted during the winter in a warm room out of the direct rays of the sun gave the following results:

On plots cultivated about one and a half inches deep, two thousand pounds of water less evaporated daily on soil of a similar character and under identical conditions which had no surface culture.

On a heavy clay soil the evaporation from the cultured plot per day was four thousand pounds less than from the uncultured.

On a clay loam it was four thousand four hundred pounds per day less.

On a light garden soil it was two thousand five hundred and fifty pounds less on the cultivated plot per acre than on that which was not cultivated.

It will readily be seen what a vast influence the daily cultivation had on the moisture of the soil. Some experiments conducted several years ago with a mixture of equal parts by weight of salt and plaster applied to the land at the rate of four thousand pounds per acre conserved the moisture of the first four inches to the amount of fifteen tons of water per acre: that is to say the soil which had been treated with this mixture contained about two weeks after the mixture had been sown fifteen tons of water per acre in the first four inches more than the adjoining plots which were not treated. This amount of water it is true is not large, but it was large enough during a drought, when the experiments were conducted, to furnish enough extra moisture to the growing oats to be easily discernible by the growth of the plant. There is not the slightest doubt but what a weekly surface cultivation of orchards from June until the last of August greatly conserves the water in the soil, while at the same time culture sets free plant food, keeps the lower strata of the soil cool and moist. Wherever the conditions do not forbid surface cultivation it should be practiced extensively in orchards for the three-fold purpose of conserving moisture, preparing plant food and shading that portion of the soil which is occupied by the roots of the growing plants.

## SOME EXPERIENCES IN 1893 IN TREATING PEARS TO PREVENT PEAR SCAB.

BY PROF. S. A. BEACH, NEW YORK AGRICULTURAL EXPERIMENT STATION, GENEVA, N. Y.

At the New York State Experiment Station, in 1893, some experiments in treating pear trees with Bordeaux mixture for the prevention of pear scab were very successful in accomplishing the desired objects. The plan of the experiments was:

1. To test the efficacy of dilute Bordeaux mixture against pear scab.

(In these experiments the formula used for the Bordeaux mixture was four pounds of copper sulphate to forty-five gallons of the mixture. The necessary amount of lime was determined by the potassium-ferrocyanide test.)

2. To compare the efficacy of three sprayings before the blossoms open with two sprayings before the blossoms open.

A large orchard near the experiment station, situated on the upland about two miles west of Seneca lake, offered a very favorable opportunity for the proposed investigation, and the owners, Messrs. E. Smith & Sons, very kindly offered the use of it, free of charge for this purpose. Some varieties in the orchard, being particularly susceptible to the attacks of the scab, had produced comparatively little first-class fruit for several years on account of the scab. Two of these varieties, White Doyenne and Seckle, were

accordingly selected for treatment with Bordeaux mixture. The Seckle trees were used for the double purpose of testing the Bordeaux mixture as a fungicide for pear scab, and also for comparing the value of two treatments before blooming with three treatments before blooming. Several other interesting and practical questions invited investigation, but it was thought best not to complicate the experiments by trying to make them answer too many questions at once, and therefore attention was directed chiefly to the two objects just named.

At the last meeting of this society, in a paper on recent results in spraying for apple, it was shown that the leading investigators in the United States and Canada were almost unanimous in their verdict for the Bordeaux mixture as being on the whole the most satisfactory fungicide yet tested for apple scab, and many of them especially mentioned a dilute Bordeaux mixture with favor.

The fungus that causes pear scab is much like the apple scab fungus in general appearance, and also in habits of life so far as these habits are known at present. It was, therefore, thought that the dilute Bordeaux mixture which had given so good results in treating apple scab might also prove equally effective against pear scab.

In the paper just mentioned on "Latest Results in Spraying for Apple Scab," it was also stated that it was very important to begin spraying before the blossoms open, for recent investigations at the Geneva Experiment Station had shown that both with pear scab and with apple scab infection begins before the blossoms open. In planning these experiments for 1893 it was therefore decided to test the efficacy of early treatments, and so three treatments before blooming was compared with two treatments before blooming.

In one part of the orchard three rows of Seckel trees were selected for the experiment. Each row contained originally thirty-six trees, but there were now some vacant places and occasionally a tree of another variety was found, so that the number of Seckle trees included in the experiment was but sixty-four, of which number fourteen were sprayed six times, fourteen were sprayed five times, and thirty-six were left untreated for comparison. Fourteen White, Doyenné trees located in another part of the orchard were also selected for the experiment. Six of these were treated five times, and the remaining eight were left untreated for comparison. The treated Seckel trees were in two blocks, one of which was surrounded by untreated infected trees, while the other was hemmed in on three sides in the same way. The White Doyenné trees were somewhat scattered, but in most cases the treated trees were separated by a short distance only from untreated infected trees. In considering the results of these experiments it is therefore well to note the fact that the sprayed trees were thus constantly open to infection from adjacent trees that were not sprayed. Where an entire orchard is treated this source of infection may evidently be obviated in a large measure.

#### TREATMENT.

One block of Seckels was sprayed May 3. At this time the buds were swelling, but none of them had begun to open. A week later, May 11, this block was treated again, together with the second block of Seckels and the White Doyennés. At this time the cluster buds were opening. After this all sprayed trees were treated exactly alike. The next treatment was made on May 19, when the trees were just beginning to blossom. As soon as the trees were out of blossom, on May 31, they were sprayed again, and Paris green, at the rate of one ounce to about eleven gallons was now added to the Bordeaux mixture. June 12, and again June 28 the trees were sprayed with Bordeaux mixture and Paris green as before.

The fruit was picked the fourth week in September, assorted into three classes, namely: firsts, seconds and culls. The firsts and seconds were marketed. No use was made of the culls. The grading and marketing was done by Mr. William Smith, according to his usual custom, and a record was kept of the sales. The fruit sold at the following prices:

	Sprayed.	Unsprayed.
Seckel.		
Firsts .....	\$2.25 to \$2.75 per bush. keg.	\$1.25 to \$1.75 per bush. keg.
Seconds .....	1.75 to 2.00 " " "	1.00 to 1.30 " " "
White Doyenné.		
Firsts .....	4.50 per bbl=\$1.80 per bushel.	None.
Seconds .....	3.25 " " = 1.30 " " "	\$2.00 per bbl=\$0.80 per bushel.

There was no first-class fruit among the unsprayed White Doyennés. The second-class fruit from the unsprayed White Doyennés was much of it unfit for market, and was not sold. What was sold brought the price above named.

At these prices the average receipts were as follows:

Name.	Number of treatments.	Receipts per tree.	Gain from treatment.*	
			Per tree.	Per 100 trees.
Seckel .....	Six .....	\$5.48 to \$6.67		
" .....	None .....	0.88 to 0.90	\$4.80 to \$5.77	\$480.00 to \$570.00
" .....	Five .....	5.76 to 6.92		
" .....	None .....	0.93 to 1.26	4.77 to 5.68	477.00 to 566.00
White Doyenné .....	Five .....	6.55		
" .....	None .....	0.45	6.10	610.00

\* Aside from extra cost in packing and handling due to the increased yield.

The White Doyenné second-class fruit was not all sold, so that the gain from treatment appears in this statement less than it actually was. About three weeks before the pears were picked a severe wind storm blew off many bushels of the fruit. There can be no doubt that but for this unavoidable occurrence the showing would be much more favorable to the sprayed trees than it really is.

The cost of treatment was as follows, counting the cost of the mixture as one-half cent per gallon :

First treatment average per tree	3.3	gallons @	\$0.005=	\$0.0165
Second " " " "	5.	" "	.005=	.025
Third " " " "	7.07	" "	.005=	.0353
Fourth " " " "	9.	" "	.005=	.04
Fifth " " " "		" "	.005=	.04
Sixth " " " "		" "	.005=	.04
		" "	.005=	.04
Total cost material six treatments -----				\$0.1968
Cost of labor for six treatments -----				0.3561
Average total cost per tree six treatments -----				.553
" cost per treatment per tree -----				.092
" total cost per tree five treatments -----				.476
" cost per treatment per tree -----				.095

The gain per hundred trees therefore varied from \$423.10 to \$562.40, not including the extra cost of packages and handling.

For several years past these trees had been quite unprofitable on account of the attacks of pear scab. The trees were thirty-five years old and the largest ones were from twenty-five to thirty feet high. They had been given but little, if any pruning, and the tops were therefore very dense. This made it difficult to spray them thoroughly and the treatment was consequently more expensive both in labor and in material than it would have been with open top trees of the same size. It is reasonable to suppose that had it not been for loss of fruit by the wind storm above mentioned, and had the tree tops not been so dense the gain from spraying would have been more than it really was.

It should be remarked that the five hundred and sixty-two dollars' gain per hundred trees from the sale of the sprayed fruit does not represent all the benefit resulting from the spraying. Early in the season it was noted that the foliage of the sprayed trees was of a more healthy color than was the foliage of the unsprayed trees. Later in the season the difference in the health of the foliage was very marked and on account of having healthier foliage the sprayed trees evidently went into winter in better condition, and are better prepared for a good crop in 1894 than are the unsprayed trees. It was also noted that during the wind storm above mentioned a larger proportion of fruit held to the trees that were sprayed than held to the unsprayed trees. This indicates clearly that the fruit and foliage on the sprayed trees were in a much more healthy condition than was the fruit and foliage of the unsprayed trees.

Of course both the Seckel and the White Doyenne pears are varieties especially subject to the attacks of the scab fungous, and the large gains resulting from their treat-

ment could not be expected to result from spraying every other variety. Yet the fact remains that the fruit and foliage of many of the varieties grown in New York state pear orchards suffer considerable damage each year from the fungous diseases which may be successfully treated by spraying with the Bordeaux mixture and also from insect foes that may be treated at the same time with Paris green. It is no doubt true that tens of thousands of dollars annually might be saved to the New York pear growers by the universal adoption of the method of treatment which is here shown to be very successful in preventing the depredations of some of the worst insect and fungous enemies of the pear.

## SUMMARY.

1. Bordeaux mixture containing one pound of copper sulphate to eleven gallons of the mixture was effective in preventing pear scab.

2. It is still doubtful, whether three treatments are better than two treatments before blooming and after the buds begin to open.

3. With the three treatments after the blossoms fall, Paris green used against the codling moth may be safely combined with the Bordeaux mixture at the rate of one ounce to eleven gallons of the mixture.

4. Since the Bordeaux mixture is a preventative rather than a cure for the pear scab the success attending its use depends very largely on its early and thorough application.

Mr. HOOKER: We thought we saw the effects of the Bordeaux mixture in a russet—a sort of roughening of the skin, and we regarded the treatment objectionable on that account. The roughening showed on the Duchess, but not on the Bartletts.

Prof. BEACH observed a russetting on the skin of the Clairegeau, but attributed it to some other cause than spraying.

In answer to a question, Prof. BEACH said he had not experimented with the ammoniacal solution for pear troubles, but from what he had learned he was led to believe that Bordeaux mixture was the best.

Mr. T. S. HUBBARD: Do you consider it makes any difference whether the mixture is applied to the upper or under side of the leaf?

Prof. BEACH: Would prefer, of course, to have it applied to both surfaces, but could conceive that spores floating around in the air are more likely to light on the upper surface. In using the Vermorel nozzle you are apt to get some under the leaf when spraying.

Prof. BAILEY: Tell us something about the condition in which this fungus passes the winter. Do you suppose the first spraying kills the fungus on the twigs?

Prof. BEACH: I do not know how the fungus passes the winter. While the winter treatments have shown some beneficial results, yet I think the first application, when the buds are opening, is early enough for all practical purposes.

Prof. BAILEY: My question is whether these fungicides will kill the spores.

Prof. BEACH: Experiments have shown that certain spores in the presence of a small amount of copper do not germinate, but after being removed to pure water the same spores germinate. I do not know whether the Bordeaux mixture kills the spores of the pear scab or not.

Mr. J. A. ROOT: Would an orchard fairly sprayed one season be affected as much another season as one not sprayed?

Prof. BEACH: Naturally, I should think not. If you sprayed thoroughly, and kept the fungus under control, it would not be so apt to affect it. In grape vineyards they have found increasing benefits by continuous spraying. In these experiments the sprayed trees were surrounded by unsprayed trees, so that in every instance there was a constant source of infection from the unsprayed trees to the sprayed trees.

A MEMBER: If you lose a crop of pears by the fungus this year, would it be possible to have a good crop another year without spraying?

Prof. BEACH: I think the fungus is something you cannot prophecy about, and with unfavorable conditions you may get an attack, so that with the amount of fungi we have it is better to spray. Where the unfavorable conditions exist there is more danger. I have noticed in low, damp, situations that we are more apt to have it, and it is more apt to spread in cool weather.

In answer to a question, Prof. BEACH said that a strong application of the iron sulphate for grape anthracnose be applied to vines early in the spring, before the buds open.

Prof. GREEN (Ohio): The Bordeaux mixture, when applied more than twice after the fruit is set, is liable to cause a rusty appearance on some varieties of pears, notably Angouleme and Vicar.

A MEMBER: Put the sulphate of copper in an old bag or basket and let it go under the surface of the water, and it will dissolve faster than if dropped in a barrel.

Prof. LODEMAN: I sprayed apples six times with Bordeaux mixture that was much stronger than for peaches.

Prof. GREEN: It will hurt some varieties more than others, Belmont particularly, which we can only spray twice.

Mr. CAMPBELL: Could not the injury done to the foliage by use of the ammoniacal solution have been prevented by diluting?

Prof. BEACH: The experiments which have been tried with the ammoniacal solution show that where it is used the foliage, as a rule, is not of as healthy a color and in as good condition as under the Bordeaux treatment. The latter really helps the foliage. I do not know that the solution could have been weakened to any extent that it would not have been injurious to the foliage.

Mr. CAMPBELL: Have you used the modified *eau celeste*?

Prof. BEACH: Not to any extent in my work, because when I first began the experiments conducted by others showed that it was really inferior to the Bordeaux mixture.

Mr. CAMPBELL: I have understood that it was very nearly as good as the Bordeaux mixture and pleasanter to use because of the trouble in mixing the lime.

Prof. BEACH: I want to recommend what I consider best.

## RAMBLING THOUGHTS ON HORTICULTURAL SUBJECTS.

BY HON. J. H. HALE, SOUTH GLASTONBURY, CONN.

[Stenographically reported by the SECRETARY.]

Coming here last year I felt more than ever before, what big souled, broad minded, whole hearted people horticulturists were—above any other class I have come in contact with. Work among trees and plants and flowers broadens a man's soul and mind, and makes him a better citizen in every way. Our plants and trees and flowers and vines, it seems to me, seem to know and understand that, and respond more readily to the care of a man who knows and believes in them. I think those of us who are in horticultural work,—first, because we love and enjoy and believe in it, are the ones who get the most out of life—not wholly in cash returns, although the money is valuable. No one has a right to waste the God-given energies in following even a burden. The man who gets pleasure out of his daily work is the one who is getting the most out of life, and the one, also, who is likely to get the best financial results.

This thought of the heart and soul of a man being in his work should be considered in the employment of our help. We make a mistake in employing men who have no love in their work. The man who works only for his dollar is only on a par with the old horse or mule. I have found that to secure men who have a love for the business is economy, even though we pay them more. I have employed men from different sections of the world who have settled down in our New England work. When we cannot get natives, the Italians are making us the best horticultural laborers. They seem to have had some experience in their native land and to possess a natural love for horticulture. I have found them intelligent, industrious and polite. We furnish comfortable cabins for them in the back part of the farm, with bunks and straw for beds, fire wood, etc., and find them the most peaceable men I have ever employed, and loving their work. They board themselves, living very economically, eating brown bread and drinking some of their native wines. Then, too, the man who loves his work, handles everything more carefully. I like a man who is so enthusiastic in his work that he feels just as if every tree he approaches was saying "Good morning" to him. He feels that he knows his trees and plants and vines; he learns to love them, is careful not to injure them, and in gathering and packing fruit feels as much interest in their safe arrival in the market as though they were relatives whom he was starting off on a long journey.

I was pleased with that part of Mr. Garfield's paper which spoke in regard to trees and care of cemeteries. The only place for such men as he describes is under the ground. There are too many who start out in horticultural lines because they see others making money; failure follows, and then they see something else, take it up for a brief spell, and then drop it. And so they are continually making failures because they have no real soul in their work, and are simply striving after the money part.

Too many of us start out and think we have the love for some kinds of fruit and soon are led off again with the thought that we want something in which there is more money.

#### MUST RAISE BETTER STOCK.

Another thought. It was brought to my attention in the census investigations of 1890, when I found that nearly one hundred millions of apple trees, and forty or fifty-millions of plums and other kinds, were sold yearly. And when we know how few there are that thrive and come into full bearing, I feel that our nurserymen have a duty to perform if we are to make the profession of horticulture what it ought to be. This tendency of producing so many trees and plants, because of the tremendous competition, has stimulated cheap production, cheap handling and cheap sales. The man who buys a cheap article thinks it is not of much value, because if it does not live he can replace it. Novelties do well in the hands of originators and disseminators, because they believe in them, give them the best care and treatment all the way through. The man who buys these novelties and pays an extravagant price for them, has got to believe in them, consequently he gives them great care, and if they are adapted to his soil and its conditions, he comes somewhere near obtaining the objects sought. The fact that the thing cost something stimulates the best of care. You give a neighbor a scion of some fine horticultural product, and a year later enquire how it has progressed and receive some flimsy excuse for an answer; the man knows nothing of it. Why? It was too cheap. If you had sold that same man some high-priced novelty, and it had proved a failure, you would have heard of it pretty quick. So it seems to me there is a chance for the nurseryman to produce more and better stock, and then charge what it is worth, and we shall get better returns in the field and in the markets.

#### DEMAND FOR BETTER PRODUCTS AND STYLE IN PACKING.

The season of 1893 taught a good many of us object lessons in horticulture. When I heard Mr. Josselyn read the report from Chautauqua county, I thought the grape growers could not be getting very rich with the prices they got. The working man and the middle classes are the consumers of fruit, and if they are short of funds, it at once affects the markets. But the Chautauqua grape growers learned in 1893 that a nine pound basket could be sold for twelve cents and give good returns. The tendency of the times is for better products and better style in packing, and if our fruits are well grown and honestly packed the pockets of buyers will be opened.

#### PLEA FOR THOROUGH CULTIVATION.

The year 1893 in Connecticut was peculiar. Early rains were abundant and fruit started gloriously. Three months of terrible drouth, followed by terrific wind storms then came and we learned some lessons. The fruit orchards that were in condition to be thoroughly cultivated throughout the season kept steadily growing a little during that drouth, and when the storms came those thoroughly cultivated orchards held on and the damage done was nothing compared with what visited the less highly cultivated orchards. In the latter the fruit ceased growing in July and stood still, when the storms came nine-tenths of that fruit fell to the ground. The fruit that was left started again when the rains came. The free-stone varieties were cling-stones and would not start further. There were great complaints in the markets, fruit came back, and we had a good deal of trouble.

#### MUST THIN FRUIT MORE.

The question of thinning peaches, apples, pears, etc., has been brought more forcibly to me than ever before. The curculio has worked more seriously on the eastern coast than ever before in my memory. In thinning the fruit it has always been our custom to take off every curculio-stung specimen; put them into bags, take them away and burn. We have been less troubled than have our neighbors. The demands of the market are such that we must thin our fruits if we are to be successful. The demand is for larger and more showy fruit and of better quality; but particularly for fruit of fine appearance. We are allowing our friends from over the Sierras to come east and take the money we should have. Why? Because they bring in finer looking fruit than ours. Are you going to let the large sized fruit of California beat the ingenuity of the

Eastern States? We can put up fruit that is better, and that looks as well on the market. There are many things in favor of fruit growing here which do not prevail in California.

#### SPRAYING.

The question of spraying has been pretty thoroughly gone over here. An exhibition of oranges was made at our State Pomological Society's meeting last week. They were taken from a grove that had been thoroughly sprayed and cared for on intelligent lines all through. Another display was from a different grove and where the fruit had been ordinarily treated. One was magnificent and the other had the ordinary appearance.

#### FROST DRAINAGE DESIRABLE.

In Connecticut the climatic conditions interfered seriously with the successful protection of all our fruits. The subject of frost drainage has been very interesting to me. I have found that frost runs down hill almost as freely as water, and that it wants some way to get off. I prefer elevated sites for peaches. Where such a site slopes off into a basin at its foot, were neither frost nor water can run off, the frost kills the buds; but if there is an opening into a valley, with a stream that is not blocked up with weeds, etc., the frost will follow down and away, and the peach buds are saved. Elevated land with abrupt slope in a valley, affords frost drainage. The protection of our fruits as to soil conditions, climatic influences, cultivation, feeding and spraying, have all had a great deal of thought and study by the most successful horticulturists; but there, it seems to me, we have stopped, instead of pursuing the subject from a business standpoint and studying the position further along.

#### STUDY THE MARKETS.

We must not complain if we produce certain things and the markets do not want them. We should first find out what the market wants and then produce the article. Study the demands of the markets and aim to supply them. Don't remain as you were twenty years ago. Study the works of every successful and every unsuccessful horticulturist and profit by it.

It is the duty of the Horticulturist to study the markets and the people. It is all too true that the dealer in fruits knows much more about the business end of the matter than the producer. Who should know so much about *why* and *how* and *when* to place fruit as the producer? And yet, as a rule, I would rather go to the intelligent, honest dealer for information than to the average producer. I will admit that the thoughts I have advanced, of love and interest in the production of fruits, should be the first consideration with the producer, and our greatest pleasure; and if we are entirely absorbed in that direction, we shall be sure of the financial returns we ought to have. The tendency with us as producers is to stay too much among our trees and plants if we love them, and forget the business end; and the tendency with others of us is to be everlastingly at work with our thoughts and our muscles until we are tired out, and do not get away from home so as to study the markets and the people. Unless our fruit-growers will take more interest in their work and in the markets they will be as dead men. When I see much of our fruit going on the market I think, if the fruit-grower is not already dead, he is mighty near it, or he would have his fruit on the market in different form, or he would produce different fruit, or in a different manner. The question of supplying the markets is a serious one to the small producer if he is not close to a good market. The man who is so far away that he has to consign his fruit to distant markets is at a disadvantage; and he is going to remain there if he keeps to himself. The tendency now is to cooperation. There are large orchards coming along that are going to make their reputation on the markets of the world. Small growers must get together. It may be a difficult thing to do, but they must. Tilling the soil is the best business on God's green earth, always will be; and because it is so any blunderbuss can work at it. Railroad men combine; so do manufacturers and professional men and mechanics and laborers. They have to get together. It is because of the absolute independence of the fruitgrower and farmer that we have let the pendulum swing the other way. But the fruitgrowers have got to get together, if not in the dissemination of fruits, at least in the marketing of them. The tendency is towards combinations, and our fruits will have to be sold in that way, and a name and reputation made for a locality. The man who buys your small lot of fruit here or in

Buffalo, and is pleased with it, doesn't know where to get more. But the large orchards are going to be able to supply the demand and make a reputation and create a demand for large amounts. This question is puzzling me in regard to my Georgia orchard of six hundred acres of peaches. Our Connecticut orchards are so established that we can afford to advertise and make a reputation, and so secure a ready market at considerably higher prices than others get. With six hundred acres of peaches to market it becomes necessary for me to make a name and reputation for that fruit and it must be my study to find how best to reach the ear, eye and pocket of the consumer in the northern states. This is the problem that faces me, and I shall have to pay for the solving of it before that orchard can be the great financial success I hope and believe it will be. And those same questions must enter the mind of every orchardist in the future.

I said that the dealers at the present time know more of the market and of the business than the producer. Last year Sullivan county had quite a crop of apples and they could hardly find a man in all that county who knew how to pick, grade and pack that fruit properly for market. The producers had to send to New York for men who were proficient at the work, with the result that they made nearly all the profit.

#### THE VENTILATING CRAZE.

When Dr. Caldwell was talking about the preservation of fruits I thought how important it was. In the early days of my berry culture much was said about ventilating crates and baskets. My observation has taught me that we are ventilating too much. If you can pick the fruit dry and pack moderately cool, the tighter crates and baskets you put them in, and the less you expose to the air the longer they will keep. I have experimented some in sending and receiving samples of small fruits. Where strawberries are to be shipped a long distance take them when the dew is off in the morning, or at night before the dew is on them, put wads of cotton around them and pack tight, thus excluding air and germs, and you can ship to any point in the United States. I have had strawberries packed in that way keep for fourteen days. It is my plan in my southern orchard to build a large cold storage house, manufacture our own ice, and when they begin to pick peaches in the morning follow around and have the first picking reach the shed half an hour after leaving the trees, send to sorting bench, pack in the carrier and go into cold storage within an hour after leaving the tree; and keep it up all through the day. The same with berries. Pick when most convenient, but if done in the heat of the day let the fruit cool off. After once cold, the tighter you shut up the better they will keep and be more showy for the markets.

#### APPLE ORCHARDING NOT OVERDONE.

I was somewhat surprised to hear the opinion expressed here that apple-orcharding was being overdone. My observation in travels all over the country, is that intelligent apple culture is not keeping pace with the consumptive power of the people. There is a wonderful opening for the intelligent planting and care of apple orchards. And I want the young men here at this meeting to know this. It makes me ashamed of horticulturists when I go into the markets anywhere and see better oranges than apples, when apples can be grown for so much less. Apples are in greater demand not only as a healthy food, but also for the ornamentation of the table. The future of the apple industry is bright; and I believe it will pay greater returns than any other legitimate investment made on the farm or off. You must plant large orchards; the larger the more economical and more intelligently you can care for them. Save everywhere. They will last longer than a peach orchard. I was up in northern Vermont last year, near Lake Champlain, a section particularly adapted to the production of fine apples. I was speaking of the results from apple growing and a gentleman got thoroughly aroused on the subject. We are going to plant three hundred acres there. The gentlemen who are putting their money into it, some of them farmers, some capitalists, think they see a safe investment and liberal returns. But three hundred acres will hardly supply one county in New England. This idea that planting on a large scale is going to overdo the thing, is a fallacy. I can sell fruit easier to-day, and more of it than I could thirty years ago. My mother was left with two young boys. Some people labored with her and wanted to know why she let those boys take some of her best tobacco land and put it into fruit; told her they would run her into the poorhouse, but as yet no such calamity has overtaken her. Don't be afraid of overdoing.

Dr. CALDWELL thought the speaker was right in his ideas concerning the packing

and shipment of fruit. Pack carefully and tightly and keep cold. You then have the very best conditions for keeping it. Science and practice come together there.

Mr. WING R. SMITH asked Mr. Hale what he would do with men who never seemed to find anything they liked or have a taste for? They should earn a living.

Mr. HALE.—That is a hard question. If a man doesn't love to work or do anything on earth, I would like to put him under a peach tree. I pity any person, man or woman, who doesn't like to work.

Mr. Root.—We have four or five hundred Italians working on the waterworks conduit in our section, and we have been surprised to note their intelligence. I would like Mr. Hale to tell of their efficiency.

Mr. Hale replied that he had found that Italians have a love for fruits, plants, flowers and trees. They handle them with skill, enjoy their work and are apt in their work. Give them steady employment and they are more than willing to stay. I have never seen any unkind spirit among them. They are most faithful, and I can recommend them. In the South, negro labor is so cheap and efficient that we do not use any other labor there. It is good help.

Mr. FARMER: Can you put them off by themselves or do you have American bosses?

Mr. HALE. A boss of any kind is a good deal of a nuisance, if you put much emphasis on the word "boss." We send them off by themselves, and, if they are green, we send someone with them; but as soon as they show they understand we do not hesitate to send a gang off and never go near them, and we know there is no shirking. I wouldn't employ a man that I couldn't trust out of my sight.

Mr. Scoon: Did those orchards that were seeded down hold the moisture in the very dry time as well as those which were cultivated through the season?

Mr. HALE: In the orchards that were seeded down the fruit stopped growing, and was as I referred to. It was an exceptional drouth and thorough cultivation was the only one thing that saved it.

## SOME NATIVE FLOWERS FOR GARDEN CULTURE—WHERE TO GET THEM AND HOW TO CARE FOR THEM.\*

BY C. C. LANEY, SUPERINTENDENT OF PARKS, ROCHESTER, N. Y.

Wild flowers are delightfully described in George H. Ellwanger's "The Garden's Story," W. H. Gibson's "Strolls by Starlight and Sunshine," and "Sharpeyes," in Henry D. Thoreau's books, in *Meehan's Monthly*, and *Garden and Forest*, by John Burroughs, and in Mrs. Wm. Star Dana's "How to Know the Wild Flowers."

I wish that every school district in the State had these books and papers in their libraries, that boys and girls might learn the names and many curious things about the wild flowers that they see on their way to school, and in their rambles in the fields and forests. A person who has learned to distinguish the different species of one genus of plants or shrubs,—for instance the different species of dog-wood,—that the flowering dog-wood and the tiny bunch-berry, the shrub called Kinnikinnik, the pigeon-berry, or panned cornel, the red osier, the round-leaved cornel, and the blue dog-wood, all belong to the same genus, and that the leaves of all, though considerably different, are similar, and they all bear similar berries, though of different colors, has acquired a useful lesson in the observation of common things that grow about him.

Partly for the purpose of studying shrubs, a collection of all the shrubs that will grow in this climate, has been started in Highland Park, one of the three parks of Rochester. Though not a part of the plan, a collection of our native wild flowers and ferns is being made, and planted in ground as nearly suitable to their requirements as possible. The following is a partial list of the flowers planted:

The hepaticas *H. triloba* and *H. acutiloba* are among the earliest plants to blossom in the spring. The flowers appear before the leaves and are beautifully shaded with all the delicate tints from the palest pink to lavender and purple. They are found in dry stony soils in the woods, and are easily transplanted. The trailing arbutus, *Epigaea repens*, follows closely the hepaticas in the order of blooming. This delici-

\* Although this paper relates to the native flora of Western New York, it has so much in common with Michigan, it is here included as a valuable contribution upon a too neglected subject.—E. C. R.

ously fragrant little evergreen is at home on a sandy soil with chestnuts, white pine, and hemlock, among the trees, and wintergreen, partridge-berries, shin-leaf and princess' pine for its lowly companions. Generally it does not thrive in captivity, seeming to pine for its native wilds. A plant dug with a large mass of earth and planted in leaf soil from the swamp, on shaded banks and copiously watered during dry weather has blossomed one season, but whether it will eventually succeed is questionable. The blood root *Sanguinaria Canadensis*, has a beautiful pure white flower about an inch in diameter, scentless and of short duration. It belongs to the poppy family and Burns's reference to the poppy in Tam O'Shanter,

"Pleasures are like poppies spread,  
You seize the flower, the bloom is shed."

is descriptive of the frailty of the flower. I find it along old fences in the fields, whence it is easily transplanted and improved by cultivation.

Early *Saxifrage*, *Saxifrage Virginensis*, another common early sun-loving flower, found on exposed rocks, is interesting and pretty for your garden, and if it be a rock-garden, so much the better.

Spring beauties, *Clatonia Caroliniana*, the favorite of every child, goldthread, *Coptis trifolia*, a pretty little white flower with bright shining leaves and a root like a thread of gold, the pepperworts, *Dentaria Diphylla* and *D. luciniata*, Dutchman's breeches, and squirrel corn, *Dicentra cucularia*, and *D. Canadensis*, bishop's cup, *Milella diphylla*, and false bishop's cap, *Tiarella cordifolia*, are all shade-loving plants found in damp woods. *Tiarella cordifolia* is also found on the north side of dry banks in rocky woods. The heart-shaped leaves are beautiful in winter as well as in summer. The foamy appearance of the white flowers has suggested to some one the name, foam-flower.

The dog's-tooth violet, or adder's tongue, *Erythronium Americanum*, is the subject of an interesting sketch by John Burroughs in *St. Nicholas* for June, 1891. He says:—

"It is a pity that this graceful flower has no good and appropriate common name. It is the earliest of the true lilies and it has all the grace and charm that belongs to this order of flowers. *Erythronium*, its botanical name, is not good, as it is derived from a Greek word that means red, while one species of our flower is yellow and the other is white. How it came to be called adder's tongue, I do not know; probably from the spotted character of the leaf which might suggest a snake, though it in no wise resembles a snake's tongue. The dog's-tooth violet may have been suggested by the shape and color of the bud, but how 'violet' came to be added is a puzzle, as it has not one feature of the violet. It is only another illustration of the haphazard way in which our wild flowers, as well as our birds, have been named." The bulb is about eight inches deep in the ground, and it should be dug with a long knife or a spade.

Bluets or Quaker ladies, *Houstonia corulea*, pretty small blue flowers, with a yellowish eye, reminding one of the forget-me-not, thrive in the sun. They are scarce in Monroe county, but are found on the shore of Canandaigua lake and in Tompkins and Allegany counties, and in the New England States. An effort should be made, either by purchase or exchange to get these innocent looking little flowers.

Wild ginger, *Asarum Canadense*, a plant that thrives in rich alluvial soil in shade, has a very odd purple flower, growing close to the ground, sometimes even buried just beneath the surface. The large dark green leaves are very attractive. The plant grows abundantly along creeks, particularly Black Creek, seven miles south from Rochester. A plant in my yard has blossomed for several years.

A plant pleasing to children, is Jack-in-the-pulpit, *Arisaema triphyllum*, an odd plant found in moist woods, and easily grown. It has a bulb that is a few inches below the surface of the ground; pull it up and plant it almost anywhere.

The pretty little bunch-berry, *Cornus Canadensis*, a member of the interesting dogwood family, having four broad leaves at the top, and greenish flowers surrounded by a showy white involucre, grows in dense masses in moist peaty woods. The bright red berry-like fruit is very attractive, as is the fruit of all the dogwoods. I find it in the woods near the lake, and at Bergen Swamp, whence a number taken and transplanted into Highland Park are living in apparent healthfulness.

Seven species of violets grow near Rochester. *Viola blanda*, the tiny white violet and *V. Canadensis*, *Viola pubescens*, downy yellow, and *V. sagittata*, *V. pedata*, and *V. cucullata* are purple. All are well worthy of cultivation, and they look well in the grass in partial shade.

One of the most desirable of all the wild flowers for cultivation is the trillium. The white trillium, *Trillium grandiflorum*, is most beautiful, and a mass of them planted under the shade of trees is a charming sight. Two other species, the purple, *T. erectum* and the painted trillium *T. enthocarpum*, are found in this vicinity. The latter is

scarce about here, but it is abundant in the Adirondacks. The cut flowers of the trilliums last for several days in water. The white trillium with its three leaves and three white petals, is a favorite flower for trimming churches on Trinity Sunday. The bulbs may be taken up when the plant is in full flower. The flowers increase in size by cultivation.

Spiderwort, *Tradescantia Virginica*, is a flower that was a favorite with me when a boy and when it was a common flower in gardens. Mehan, in the first number of *The Native Flowers and Ferns of the United States*, illustrates the *Tradescantia* and says: "It is one of the first of our native flowers to find a home in England, having been carried to that country by the younger Tradescant before 1629." I have not found *Tradescantia* growing wild in New York State, but it grows in Michigan and on the western prairies. I found it on the outskirts of Chicago last June.

Wild crane's bill, *Geranium maculatum*, is very effective in large masses in the sun. Last year the masses of this flower growing in the fields were particularly fine. Herb Robert, *Geranium Robertianum*, found in shady swamps, requires planting in leaf-mold in a shady place.

The delicate evergreen moss-pink, *Phlox subulata*, with its pretty pink flowers, is a charming plant for massing on rocky soil. It forms a dense sod, and it can hold its own against all comers. I find it near Scottsville, and on sunny, rocky places near the lake. It has been claimed that the purple phlox, *Phlox divaricata*, found in the dense shade of beech woods, is capricious under cultivation, but plants set out three years since, in Highland Park, were in a flourishing condition last year.

For several years I have been looking for the lung-wort, *Mertensia Virginica*, a most delicate pink and blue flower with pretty, pale-green leaves. Last May, while strolling along a romantic, rocky stream, lined with beech trees, I suddenly came upon a small island, containing about an acre of land, covered with these most beautiful flowers in all their glory, and it was a most entrancing sight, worth walking miles to see. The name of a station on the Auburn branch of the N. Y. C. & H. R. R. R. has been changed from West Farmington to *Mertensia*, for this plant that grows near the station. The yards in the village are filled with the flowers early in May. A few of the plants are found on the banks of the upper Genesee river.

Marsh-marigold, *Caltha palustris*, a favorite flower of poets and painters, though found in shaded streams, grows well in the garden. To a critical eye, it seems out of place away from its native marshes.

The twin-flower, *Linnaea borealis*, a pretty, evergreen creeping plant, is scarce. It thrives in crevices in rocks in shade, and also in swamps, but it requires a rich, peaty soil. Linnaeus had a special regard for this plant, and, at his request, it was named for him.

Early in June, comes the lovely lady-slippers. Five species, *Cypripedium candidum*, *C. acaule*, *C. pubescens*, *C. parviflorum* and *C. spectabile*, the last not flowering until July, are growing in the vicinity of Rochester. *C. spectabile* is the most beautiful of them all, and fortunately is easy to cultivate. *C. acaule*, though scarce about here, is abundant on the north shore of Long Island. It is difficult to establish. Five hundred plants of these five species are growing in a shaded leaf-soil at Highland Park. During the dry summer weather they are well watered.

The showy *Orchis spectabilis*, bearing white, pink and purple flowers, grows on sandy, shady hillsides, and it thrives in rich garden soil. The small fringed orchis, *Habenaria psycodes*, and the yellow fringed orchis, *H. ciliaris* and *H. orbiculata*, are found in swampy places, and are easily cultivated. Another plant of the orchis family, that is found on sandy soil, is the rattlesnake plantain, *Goodyera pubescens*. The leaves are thickly clustered around a base, and are beautifully netted with white and green. The flower spike is about a foot long and handsome. A large number of these have been planted in the parks, and they are thriving. Ladies' tresses, *Spiranthes gracilis*, and *S. cernua*, are found in moist banks in September and October. I have found *S. cernua* in dry, sandy meadows. *S. latifolia* blossoms in June and grows on moist banks. They are all easy to cultivate.

*Calopogon pulchellus* grows in sandy soil as well as sphagnum moss. Its bulb is like a large bean. It is well to plant it in chopped sphagnum moss and peat in the shade, and to water it copiously on alternate days during dry summer weather. *Calypso boreal* has not been tried sufficiently to warrant its recommendation.

The pretty little member of the primrose family, the star-flower, *Trientalis Americana*, with its starry white flower, grows in moist beech woods. Planted last June, it now seems to be thriving.

The barren strawberry, *Waldsteinia frageroides*, a dwarf-growing plant with shining leaves and a yellow flower, a companion of the star-flower, thrives in sun or shade.

Three lilies, *Lilium Canadense*, *L. superbum* and *L. Philadelphicum*, are well adapted

for planting among shrubbery. The plants should be staked when in blossom, and the bulbs taken late in the fall.

Blue-eyed grass, *Sisyrinchium Bermudiana*, an accommodating little plant that adapts itself readily to almost any condition, is scarce. A few have been found on the Pinnacle hills. The tall meadow-rue, *Thalictrum polygamum*, with its long white flower-spikes, and handsome foliage, looks well in masses. It grows wild in damp, shady woods, but thrives exposed to the sun. Rue-anemone, *Thalictrum anemonoides*, a rare and choice plant growing on the north side of ravines, with azaleas, has thrice compound leaves and umbelliferous white flowers. The tuberous root bears removal. Early meadow-rue, *Thalictrum dioicum*, though not having a showy flower, has graceful foliage.

The four plants called Solomon's seal, *Polygonatum, biflorum*, false Solomon's seal, *Smilicina racemosa*, *Smilicina biflora*, and *S. Stellata*, the mandrake, *Podophyllum peltatum*, highly esteemed in England, bearing great green leaves and waxy white flowers, wild sarsaparilla, *Aralia nudicaulis*, spikenard, *Aralia racemosa*, white baneberry, *Actea alba*, and the bellwort, *Uvularia perfoliata* are early blooming plants that are abundant in dry woods and desirable to plant in shady places.

*Senecio aureus*, the golden ragwort, a bright yellow flower, of the compositæ family, blooming late in May, is found in moist places. The anemones, *Anemone Pennsylvanicum*, and *A. nemorosa*, are pretty flowers with pure white blossoms. The former grows along the shaded banks of creeks and rivers, and the latter on the margins of woods, not plentifully in Monroe county,—a few only being found in the town of Hamlin, but they are abundant near Buffalo.

The turtle-head, *Chelone glabra*, frequenting moist woods and having a peculiar white flower with a turtle-like head, is an interesting plant, disliked by many for its snaky appearance. Black-snakeroot, *Cimicifuga racemosa*, bearing long white racemes of feathery flowers, is conspicuous at a distance and is good for a massing in shady woods.

*Collinsonia Canadensis*, is a pleasing plant, growing in masses on the border of oak, chestnut and sassafras groves, has small yellow inconspicuous flowers.

The columbine, *Aquilegia Canadensis*, is a showy plant for the rock garden, and the Rocky Mountain columbine, *Aquilegia canadensis*, is very beautiful, having blue and white flowers.

Thoreau writes of the lupine, in "Summer" under the date of June 5: "The lupine is now in its glory,—it paints a whole hill-side with its blue. The earth is blue with it." Growing on dry, sandy soil, it is sensitive of disturbance, and the roots, being long and straggling, require the removal of large balls of earth.

Swamp Rose-mallow, *Hibiscus Moscheutos*, not found in Monroe county, grows in the marshes at Cayuga lake, and marshy lands near the eastern sea coast. The large flowers, varying from a pure white to a deep rose color with a lighter center, are not beautiful, but as Meehan says: "the plants aid in giving beauty to the natural scenery." It is easily raised from seeds in the moist soil of a garden. A gentleman interested in our parks has presented a large number of the seeds to the Park Commissioners, and the young plants from the seeds are thriving.

The flaming orange-colored butterfly-weed, *Asclepius tuberosa*, is a grand plant for massing on dry, sandy soil in the sun. All the milkweeds are pretty when examined closely. The four-leafed milkweed, *A. quadrifolia*, found early in May, in the dry woods, is the prettiest of them all. The others are the common milkweed, *A. cornuti*, poke-milkweed, *A. phytolaccoides*, and the swamp milkweed, *A. incarnati*.

White snake-root, *Eupatorium ageratoides*, abundant in shady ravines and damp woods, is a charming plant for the garden or the house, and requires, rich, moist soil and shade.

Early in July the hedge-nettle, *Stachys palustris*, having a pretty purple flower-spike appears along the edges of running streams or ponds. The banks of the old Genesee Valley canal are lined with it, and the effect, when the flowers are in bloom, is very fine. The plants are easily raised from seed.

A pleasing effect is produced by massing several hundreds of asters. *Aster Novæ Angeliæ*, and its variety, *rosa*, *A. puniceus*, both the white-stemmed and red-stemmed varieties, *A. laevis*, *A. multifolius*, *A. cordifolius*, *A. eriocides* and *Solidago lanceolata*, *S. Canadensis*, *S. nemoralis*, *S. caesia*, *S. latifolia*, *S. Aguta*, *Eupatorium purpureum*, *E. ageratoides* and two hundred or three hundred plants of *Helianthus divaricata*, and *Helianthus decapetalus*, in a deep hollow against a background of willows and osage-orange.

The cardinal flower, *Lobelia cardinalis*, the brightest in color of all the wild flowers, is attractive with its deep scarlet flowers, which may be seen at a long distance. It is easily cultivated, and it is particularly fine when massed against evergreen shrubs.

The rich alluvial soil of creek bottoms, in partial shade, is the home of the cardinal flower. I have found it in great abundance on Black creek, near its confluence with the Genesee. The great blue lobelia, *L. syhilitica*, is at home both in sunny and shady places, in moist soil, and is easy to cultivate.

The lovely fringed gentian *Gentian crinita*, of which Bryant sings so sweetly, and other poets praise, is comparatively plentiful around Rochester. It delights in the water-soaked soil on the sloping banks of the lower river, "the Dugway" and Mendon ponds, and it is mentioned in "Cayuga Flora" as being found at the ponds of West Junius, several miles north from Geneva. It never seems at home in cultivation, but to be enjoyed should be sought for in its native haunts. What brook-trout is among fishes, so is the fringed gentian among flowers. The five flowered gentian *G. quinqueflora*, and the closed gentian, *G. Andrewsii*, grow near the fringed gentian, but I have never found them all together. The closed gentian, a perennial and easily cultivated, is abundant on the upper river flats, where I have not found the other two.

We have four climbing vines besides the grape vines in Western New York. The wild bean a member of the pulse family, bearing fragrant "reddish-brown" flowers, as Ellwanger describes them, is one of the best. Bitter-sweet, *Celastrus scandens*, though having no attractive flowers, has brilliant fruit, which persists all winter. The virgin's bower, *Clematis Virginiana*, with its numerous white flowers, climbing over shrubbery along river banks, is very pretty. Canadian moonseed, *Menispermum Canadense*, bearing dark green lobe leaves and black berries, is a desirable plant. Night-shade, *Solanum aulcamara*, a plant naturalized from Europe, has become established here. Its purple flowers and bright red berries are quite attractive. The berries are said to be poisonous, but I believe that point is not settled.

To enumerate all the wild flowers that may be grown easily in the garden, would be a tiresome task, and I must omit many of my favorites. When one becomes familiar with a few wild flowers, the interest in them increases until he wishes to know them all. First you find your flower, and then try to learn its name. In nearly every village there is some one familiar with wild flowers, who will gladly tell all that he knows about them. In several villages of Western New York there are wild flower clubs that meet weekly during the summer, and they are always pleased to receive wild flowers for identification. The fear of being poisoned deters many people from going into the woods, and it is not strange when so much is heard of poison things. We hear of poison ivy, poison oak, poison elder, poison dogwood, poison hemlock, poison sumach, deadly nightshade, and all the banes from bug-bane to wolf's bane, but there are only two plants, easy to distinguish from all others, poison ivy and poison sumach, that are poisonous to the touch. By keeping away from these, and abstaining from eating anything not known to be harmless, a person is safe.

President BARRY said the object of this paper was to awaken among the members an interest in wild flowers—the cultivation of beautiful things which could be secured by members in their own neighborhood without cost. He commended this subject to the young people of both sexes, and hoped that at some future meeting they would be favored with a paper on this subject from the daughter of some member of this society.

## PLUM CULTURE FOR WESTERN NEW YORK.

BY S. D. WILLARD, GENEVA, N. Y.

It is quite proper for me to say that circumstances beyond my control have so absorbed every moment of my time for weeks past that not one moment of thought has been given to the subject on which I have been expected to address you at this time, until a few hours before leaving home, hence I shall be quite brief and, I fear, devoid of the interest that may be expected on such a subject. In short, I shall only answer such questions as have been presented to my consideration from various parts of the country during the past twelve months relative to the subject of plum culture, coupled with some observations and my opinion as to future probabilities.

Well, in a wide range of correspondence, from Kansas to Nova Scotia, from parties interested in fruit growing and desiring the greatest possible light on which to base future operations, every letter has been full of inquiry regarding plum culture. "What I think of future probabilities and possibilities? Is there any likelihood of its being over-done; varieties of most value; best method of pruning; would I advise thinning of

fruit on the tree, and if so, when?" and hundreds of like questions, many of which it would be impossible to answer, all showing a rapidly-growing interest upon this branch of fruit culture and an inclination to study the question of plum growing to the exclusion of everything else in the way of fruits. Apple, pear and peach seem to be ignored in the struggle to push the plum to the front. Hence, the occasion of taking up these points in treating the subject at this time. Perhaps the reading of a letter received only yesterday would better illustrate the situation, and yet this is only one of hundreds received during the year, except that this is more concise and easily answered. "Is the Japan plum hardy? What are the three best varieties of Japan plums? Are Bradshaw and Niagara identical? What five varieties of plums, and in what proportion in a hundred would you set for market? Is the Wilder pear hardy? The questions relate to our location here, where we have only summer and winter. The ground never freezes; potatoes and carrots can be left in the ground all winter. Snow comes in the fall and stays until spring. We have two feet now. Mercury goes a little lower sometimes, but we do not feel the cold so much and like this climate. Peaches will do about as well here as at Rochester. We lost a few Reine Claude last year, set the year before. It is not hardy."

Even in the state of Maine, as represented at the late annual meeting of the State Board of Agriculture, they seemed more interested upon this than any other topic, and, to my surprise, showed a degree of intelligence upon the subject and all of its bearings not equaled in this favored region. They are there growing this fruit with great success, and are sooner or later to become sharp competitors with New York growers, Boston and other eastern markets.

Nova Scotia, through her Annapolis Valley, so long noted for her production of superior apples, is now pushing the plum interest more rapidly and extensively than any portion of equal territory in the United States; and with the removal or reduction of the existing tariff as a possibility in the near future, can place her products in New York, Boston and Philadelphia, by water, in better condition and at far less expense than we of Western New York.

California is already supplying our city fruit stands with its fruit, so beautiful in appearance, although poor in quality, as to force the sale of such varieties as are grown by us for the same purpose, at prices far below what we received a few years since.

The lake regions of Ohio are planting plums more than formerly in resetting land formerly covered with vineyards, as they have been found to be far more profitable.

This fruit will find its way south and westward to markets which have heretofore been supplied largely from our own state, and possibly in seasons of surplus to Buffalo, which by water communication can be reached quite as cheaply and in better condition than from many sections of New York, while Northern Michigan, unequalled for the production of this fruit, on its cheap lands, with a climate tempered and rendered especially congenial by the waters of Lake Michigan, can defy competition from California or any other section for a long way to the south and westward to the Missouri river.

Let the doors be opened wide and the province of Ontario will fill the markets bordering and contiguous to the lake region, which are already compelled to unload their surplus at interior points by express at rates of transportation entirely too high to afford very profitable returns to the producer.

I trust I may be regarded as no pessimist, but my observations made and compiled with care with reference to practical deductions, impel me to present these thoughts to the fruit growers of Western New York now here assembled in convention, with the suggestion that this subject be studied with the care and wisdom that it deserves, as I know that the profits of a few years since have led many to regard this branch of horticulture with exceptional favor when considering the subject of what to plant.

The fact that my own ventures, began years since, have been accompanied with a fair degree of success, has in some instances at least, produced a misapprehension in the minds of those who have assumed that I was an ultra advocate of universal plum planting. This I desire to assert is a mistake. There is a very strong tendency upon the part of our people, whether in New York or elsewhere, to over-production in everything they undertake. As goes one, so goes all. This has been notably so in all manufacturing, the result of which is the extreme prostration of such interests in this time of financial troubles, and none understand this better than those in the production of trees, an industry involving risk and an outlay of capital which often requires years to again turn into money. Conservatism should govern at every corner, but the reverse has proven to be true. The strife has been to see who could plant most with no thought as to the final outcome, hence, the existing conditions of the hour—over-production and incalculable loss on every hand. We had once been led to believe that America could never supply the world's wants for bread, but labor-saving machinery

and cheap land have stimulated production so far beyond consumption that we are confronted with the proposition of "May wheat in 1894 at 64c."

Not many years since an acquaintance, in reply to what varieties of apples should be planted for profit, said, "I would plant ninety out of every hundred Baldwins, and then I guess I would make the other ten Baldwins." We have lived to see that in a year of great productiveness for the apple there is too great an excess of Baldwins to afford the largest profit—an over-production of a single variety of the apple—and so our illustrations could be multiplied without limit. Our danger line is in over-production of everything raised, and let the plum grower approach it cautiously in his future deliberations, remembering that the consumption of this fruit beyond the requirements of the near-by canning factory must be in villages and cities of easy access by quick and expensive transportation, or its perishable nature will soon render it unfit for market.

It should be understood that we argue from our own standpoint as a New York fruit grower, while if twenty-five years younger, holding the views now entertained, we might see the subject in a vastly different light when viewed from some other of the sections referred to. But, as the plum is not a long-lived tree, requiring intensive culture and intelligent care to the attainment of satisfactory results, we should commend this culture in a moderate way in connection with other fruits, so as to have the greatest variety of all such fruits as can be successfully grown and marketed from our location. This has been the theory of our own work and that advised for others for several years, and which we believe not only safe, but entirely practical.

We regard systematic annual pruning as very desirable in a plum orchard, beginning at the second or third year after planting, depending on the growth made and upon varieties inclined to make wood rapidly, removing or cutting from one-fourth to one-half of the previous year's growth, thus taking the necessary steps toward the formation of a compact head and the development of the fruit spurs near the body of the tree where the future crop may be carried safely against violent storms, and reducing the liability of the limbs being broken and split to pieces. This work may be done safely at any time during the time that the tree is dormant. Nor can a lack of care in this regard while the tree is young be overcome in after years by any subsequent effort to make good lost opportunities.

As a subject of no less importance, oftentimes involving the health and even the vitality of the tree itself, is the proper thinning of the fruit. The average quality rarely sells at anything over average prices, which are often very low, while large, finely-developed fruit, only bring prices that afford the profit, and such fruit is not found on trees over-loaded beyond their power to properly mature.

In every department of nature the effort of reproduction so taxes vital forces as to make it a weakening process, nor in all of our fruits is this more manifest than in the plum, which is so often depleted from a single year's over-production, as to never recover from the injuries so inflicted.

Do not be deceived. It is not the production of the fruit, but the perfection of the pit to perpetrate its species, that reduces the vital powers of the plant, and often leads to premature death. Hence, we say after the droppings which usually follow the setting of a large crop of fruit, the wise plum-grower will see to it that a large portion of that which remains is removed, the result of which will be an increase in the quantity fit for market, quality greatly improved, and trees unimpaired in vigor that at once upon the removal of the crop begin to store up the necessary material for its repetition.

A lack of the exercise of common sense, coupled with the greed of man to attempt to eat more than he can digest, has destroyed or rendered worthless more plum trees than all other causes that can suggest themselves to human minds. Unimpaired constitutional vigor, in the tree as in the man, is required in the attainment of the object, in its broadest and best sense, for which either were created.

So closely connected with the question of thinning is the time of picking, that the two should be considered together; hence, we say, at the earliest possible moment after fully grown, colored and sufficiently matured to answer the purposes for which intended, or the markets designed for, pick and ship, although a week later might show a material advancement in price. They will ripen to a certain extent after being picked, and at this stage of maturity will stand up well for distant shipment, while the overburdened trees, with the relief offered, will begin to recuperate, and the processes of nature set at work to restore the exhaustion incident to the product and equip itself for making another crop. Certainly no mistake will be made in working on this line. Preventives are much more potent than are any attempts to repair damages already accomplished.

But, while every one is thinking of the plum, let our attention be directed to the cherry, the pear, the peach, and the to-day greatly-neglected apple—that most valued of all fruits—not one orchard of which in one hundred is receiving even decent care in

this or any of the apple-growing states of the Union. The thorough-bred animal is fed with the well-balanced ration fitted to develop the desired qualities to be attained, or to ruminate over the richest pastures of the farm in search of the choicest plant-foods of its own selection. But the tree, located at one point for life, is left uncared for and unfed to struggle for its existence in the circumscribed area of its roots, from which years since have been gathered all of the essential elements required in building up the structure on which to produce anticipated crops. "Life is a failure." We see only a moment of man's stupidity. Have we not been told, "We cannot gather grapes from thorns, or figs from thistles?" "By their fruits ye shall know them." It can be easily understood why so many have come to regard the apple crop as a failure—too many of one variety and starvation everywhere has much to do with existing conditions of the apple orchards as found where they have been growing for years.

This treatment, as applied to the plum, will never answer, and will result in utter failure of root and branch long before the apple has attained its maturity; hence, we say, give the plum the most generous care, and the most liberal plant-food, well balanced with phosphoric acid, potash, and a slight percentage of nitrogen, if you would secure anticipated results. Consult your best authorities as to varieties that can be grown with profit, and wanted in the markets you may ship to, and then confine your efforts to planting only a few varieties, and avoid the mistake of attempting the culture of forty or fifty sorts, many of which have no value whatever except for exhibition purposes at our fairs, but test in a very modest way new varieties, which often are of no value in the commercial orchard. Do not under-estimate the battles to be fought with diseases and insect life, which are annually on the increase, and will so continue so long as there be an increase of trees on which to feed.

Arm yourself with all available information from those whose life-work in connection with our experiment stations and other institutions of learning especially fit them to give all required instructions as to the work in which we are engaged, and you will find yourself qualified well to conduct, with the greatest possible success, the growing of such varieties of fruits as should be found in every commercial orchard in Western New York.

The position we occupy in relation to our markets commercially and geographically is essentially different from that of most other sections of our country, and while our soil and climate afford opportunities unexcelled for growing the greatest variety of such products as are needed to meet the requirements of a rapidly-increasing population, let us not make the mistake of ignoring our talents and confining our efforts only to raising any one of the many kinds which may in adverse seasons over which we have no control, prove a failure, and lead us to join the procession of those who, from their disappointments, pronounce their life-work a failure.

By special request the following list of fruits are commended for general orchard culture for western New York:

PLUMS—*Six sorts:* Reine Claud De Bavay, Field, Coe's Golden Drop, Hudson River Purple Egg, Bradshaw, Fellemborg.

PLUMS—*Twelve sorts:* Reine, Claud De Bavay, Field, Coe's Golden Drop, Gueii, Peter's Yellow Gage, Grand Duke, Hudson River Purple Egg, Bradshaw, Fellemborg, German Prune, French Damson, Monarch.

PLUMS—*Japan sorts:* Yellow Japan, True Sweet Botan Burbank.

APPLES: Duchess of Oldenburg, Wealthy, Ben Davis, Hubbardston's Nonsuch, Lady Sweet, Sutton's Beauty.

In connection with the request that Mr. WILLARD should recommend lists of varieties, a number of questions were asked, to which the essayist replied that he would commend Reine Claude de Bavay for one. It is tender, and the question of over-production, to which he had called their attention, was one of the prime causes of the failure of this variety. The most healthy trees of this variety on his own place, and which have been planted twenty-two years, were top-worked on Lumbard. Fellemborg should be top-worked on Union Purple or Lumbard, the two best plums to top-work on. Grand Duke is better when grafted on something else. He never had a failure, and preferred to top-work as last named. Monarch is larger than Grand Duke and a little later; one of the best late, new plums.

Speaking of the Japan plums, Mr. WILLARD said: True Sweet Botan is different from the Abundance, which came to me as "Botan No. 6." Another, No. 30, is the True Sweet Botan, and it is different from the Abundance, and a better plum.

Prof. BAILEY: What about Botan No. 32?

Mr. WILLARD: That is Yellow Japan.

Pres. BARRY: What is the matter with Victoria?

Mr. WILLARD: Ellwanger & Barry's Victoria, and the one from Rivers' are one and the same. The fruit did not seem to mature, and has a disposition to decay. We

have grafted over what we have of the Victoria, because we thought we could make more money with something else. I think those I have named a little better.

Prof. BAILEY: If you were to name twelve best plums would you put any Japans in them.

Mr. WILLARD: Yes, I would. I differ in opinion with some in regard to the handling qualities of the Japan. Certainly some have a tender skin, and unless carefully handled in packing, the skin becomes discolored, which hurts their market value. If handled nicely they are good to market.

Prof. BAILEY: This Yellow Japan—are you sure No. 32 is the same that Berkman's had? Theirs is supposed to be yellow-skinned.

Mr. WILLARD: Mine is yellow with a carmine spot on one side, a superior plum. The list of varieties is different from what I would recommend to a Michigan fruit-grower, because there is the question of hardness to be considered. I prefer a solid body of frost through the winter. The damage comes, not from excessive cold, but when there is no frost at all in the ground; and when we have snow at the same time I feel good.

Answering further questions, Mr. WILLARD said: Mooney, Bradshaw and Niagara are the same. Niagara is not a good canning plum. While Coe's Golden Drop is not as good a bearer as Reine Claude. It is more hardy, and one of the best yellow plums we have.

Mr. PIERCE: At the Ohio meeting in December you named a different list from that named here.

Mr. WILLARD: I make my list with regard to climate, etc. There is a difference in degrees of hardness. I put in Golden Drop and give both in the list because they are hardy. Field is a good bearer. Turkish Prune is not different from the Italian. I have been told by good men that they are identical—also Fellemborg.

Mr. J. O. RUPERT: Two years ago, at the state fair, the Turkish Prune and Fellemborg were in one exhibit, and there was a difference in the sample.

Pres BARRY: What about the Hungarian Prune?

Mr. WILLARD: The same as Pond's Seedling.

Pres. BARRY: That may all be, but when you get to the right name there is a distinct variety under the name of the Hungarian Prune, one of the most distinct of all the prunes; and if California has taken the liberty of attaching that name to Pond's Seedling we should put our foot down on such a proceeding. The nomenclature of fruits has been very correct, and it took a great deal of labor to secure their correctness; but the tendency now is to bring up a confusion and destroy the value of the labor of our forefathers. Through the efforts of the American Pomological Society, the nomenclature of fruits was settled definitely. We must not allow this confusion to come in and destroy their work. I insist on the Hungarian variety.

Mr. WILLARD: I wrote the department of agriculture three years ago, asking if they could be positive and tell me what the Hungarian Prune was that was being disseminated. Mr. VAN DEMAN wrote that it was the same as Pond's Seedling; but I know that in California they are disposed to do the thing our president speaks of.

Prof. BAILEY: Hungarian Prune as grown by Ellwanger & Barry is a very different thing from Pond's Seedling.

Pres. BARRY: I hope we will now go on record as defending the nomenclature as it has been settled. We have standard authorities in Downing, Barry, and the American Pomological Society.

Mr. WILLARD: I received a plum from Oswego, which I was told was an extraordinary good variety. We grafted several good trees, and it turns out to be Pond's Seedling.

Mr. ROOR: It is important that we have good shippers. Express charges are high, and thousands of bushels go to waste. I have known farmers to pick and market them at twenty-five cents a bushel, and it is discouraging to have plums go to waste because of being unable to ship more cheaply.

Prof. GREEN: Some growers of German Prune in Ohio complain that it blooms late and does not fertilize well.

Mr. JACOB WENTZ said the German Prune was one of the best plums Rochester has had for the last thirty years. They have sold as high as \$8 per bushel, but within a year or two have sold as low down as fifty cents. The average price obtained is from \$2 to \$2.50. If the German Prune is thinned out it will stand with any plum. In Germany they call it "Schweitzer." There is one here which is as large as an egg plum, and is called French Prune; it is good only when top grafted, and is a little scrubby. One year he shipped plums to New York City and got \$5 for French Prunes against \$3.50 for German. The German Prune in Rochester is a free-stone.

Mr. HOOKER: There is a peculiarity about the true German Prune; they bloom after

other varieties; flowers small. You can tell them by the flower; think they have always fruited after a certain length of time; slow growers; tender and liable to injury in winter.

Mr. ROOT: Is there any benefit in setting other varieties near them?

Mr. HOOKER: I think very little fruit is lost from want of fertilization. I think the German prune the last to flower.

Mr. LUTTS: I kept a record last season of about fifty or sixty varieties and found that the German prune was the last to blossom; think it fertilized itself. The first ten or twelve years they did not set the blossoms.

Mr. ATWOOD: Are not many of the German Prunes that are in bearing in the neighborhood of Rochester raised from seed?

Mr. WENTZ: Yes; and about two miles north of the city there are some two hundred farmers who have raised these fruits from sprouts; but the fruit is smaller than those we propagated.

Mr. LUTTS: Do the seedlings come into bearing any sooner than if taken from the nursery rows?

Mr. WENTZ: In about five or six years.

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## QUESTIONS AND DISCUSSIONS.

*What is the cause (process) of injury to the roots of dormant trees under the action of freezing and thawing, and what is the best method of drawing the frost out of frozen roots?*

Mr. C. M. HOOKER: I do not know the cause. We found that trees which had been frozen experienced no injury when the frost was drawn out slowly by placing them in earth out of doors or in cellars. When the frost was taken out rapidly in the atmosphere or by the application of water the trees were entirely destroyed. A good many years ago a load of our apple trees, on a tree rack, left in a barn over night, were frozen. The foreman applied cold water to the roots, thinking it would be a nice way to take out the frost. The result was that every tree, the roots of which were touched by the water, was killed. Those which he placed in the earth came out in perfect condition. So that it is not so much the actual freezing which causes the injury as it is the manner in which the frost is extracted from the roots.

Mr. J. F. WHITE asked if Mr. Hooker examined the roots of the trees to see if the water that was applied had cracked the bark of the roots?

Mr. HOOKER: Where the water touched the roots they turned red, as if scalded.

Mr. WHITE: In my experience I believe damage resulted from the fact that the water applied entered the cracks in the bark of the roots.

Mr. T. S. HUBBARD: The great secret is to keep frozen stock from exposure to the air.

Mr. WING R. SMITH: If the trees had been submerged in water would not that have had the same effect as burying in earth?

Mr. HOOKER: The water was simply thrown on. The trees which were saved were all healed in alike.

Mr. M. B. WAITE said, freezing concentrated the water in crystals, and thawing suddenly released the water too quickly, drowning a portion of the protoplasm and leaving the rest dry, thus disorganizing the cells.

Mr. G. W. CAMPBELL, Delaware, Ohio: My experience has been with grape-vines; and we all know that a vine planted in the ground will freeze in winter deep down as far as the roots grow, and thaw out gradually in the spring. I have had grape-vines shipped to me in boxes, which arrived frozen solid. They were planted deeply and let remain until the frost gradually left them and they received no injury.

Prof. S. A. BEACH: In one of his publications De Bary states that when freezing takes place the water from the cell passes through the cell-wall and freezes on the outside forming needles of ice on the outer surface of the cell-wall. When thawing takes place rapidly, the water is liberated in the midst of the tissues on the outside of the cell-walls and cannot then be absorbed into its original condition as a portion of the protoplasm and cell-sap. On the contrary, when the crystals are thawed out slowly, the water, as fast as it thaws, is absorbed within the cell, and combines in the original way with the protoplasm.

*Are the Botan and the Abundance plums worthy of attention by western New York growers?*

MR. WILLARD: Yes, they deserve attention on the part of all who are experimenting, but I do not recommend them for cultivation on a large scale until more thoroughly tested. "Botan" is a general name for an assortment. Abundance is one of that family. Burbank, a seedling, is better and more profitable to raise than the others. Yellow Japan, I think, better than all.

PRES. BARRY: To what extent are they grown, and how as to their hardiness?

MR. WILLARD: Hardy on my grounds, having stood, without injury, with the thermometer fifteen below zero; and that, too, when the trees had been cut back strongly for buds and had sent out a second growth. They have been found hardy in Michigan.

MR. J. S. WOODWARD: Is not Burbank a "Botan"?

MR. WILLARD: No. They were imported direct from Japan. Prof. Van Deman recommended Burbank to me. He said it was the best because the others bloom a little too early sometimes. I said we didn't often suffer that way at Geneva. He said it bloomed later. I found it just exactly as he stated. In my opinion they are not nearly as liable to the black knot as our European variety. I have seen only one instance, and that very slight.

Replying to an inquiry as to the quality of the fruit, MR. WILLARD said with such a great variety of tastes as one found it would be difficult to give an honest expression. He thought them pretty good, as good as Lombard. They are reasonably good shippers, but need to be handled with care, as they are thin-skinned.

MR. BELL: How long have you propagated Abundance?

MR. WILLARD: At random, should say, perhaps, seven or eight years or more from the bud. I think I was the first to attempt the cultivation of any of these plums in western New York.

MR. HOOKER: Most varieties of Botan plums blossom very early, and consequently are more liable to destruction from frost than any ordinary variety. We lost a crop. We have the Kelsey, Ogon and Abundance; have found them very hardy; never saw a twig injured. Some are of fair quality, the Abundance being about as good as Lombard; comes earlier. They are good keepers and good shippers; but it is too early to recommend them for general planting. Abundance is early and that is its principal value, in addition to which it is of vigorous growth and free from black knot or any disease.

MR. WILLARD: Burbank is not an early plum; in fine condition about September 10. We have four hundred trees worked over to that variety, and have great faith in them.

To the question as to the difference between Ogon and the others, MR. WILLARD said he would not grow it.

MR. HOOKER: We have only one tree.

Being asked about a variety called "Botan 26," MR. WILLARD said it was one of a lot of scions he got from San Francisco. It ripens July 15, and rarely fails, but it is the poorest of any in quality; not so poor as Ogon, but would not commend it. Satsuma is a good plum, and very different from others; purple in skin and meat; late; has not yet been tested, and but little inquiry for it.

MR. J. S. WOODWARD had visited a gentleman in Columbia county who has the largest Japan plum orchard in this state. He took some fruit home and it was in good condition for two weeks. The Japan trees are good bearers and the plums good keepers. The Japan plums possess a good deal of merit. There was another variety, larger than either Burbank or Abundance, but he did not like it so well as those varieties.

The question was asked, "What is the best soil on which to raise Japan plums?" and MR. WILLARD said he thought they would grow on any soil; he had seen them on sand on the lake shore in northern Michigan. He had some at Geneva on heavy clay and could see no difference. He thought Mr. Burbank of California had produced a lot of seedlings that are going to change the character of plum-growing throughout the country.

MR. HENRY LUTTS said he considered Ogon one of the finest of canning fruits. It was not good out of the hand, but as a market plum there were none that would keep better; will keep three weeks after being picked. The Burbank, with him, last year, was ready for market August 15. They can be shipped green and will get to market in good shape.

Prof. BAILEY thought there was a great deal of confusion about the nomenclature of the Japan plums. There were thirty-four named varieties and a number of unnamed seedlings. The Japanese plums may be classed under three general heads: *Sumomo*, a small, very early type of round plums, represented by the Berger; *Botan*, round or

flattened plums, of several varieties in this country; *Hattan*, pointed plums, to which the greater number of our forms belong. The varieties which are known to be hardy as far north as New York are Willard (Botan 26), Abundance, Chabot, Satsuma, Burbank, Ogon, Berger. The latter is too small for market. Most Japanese plums are good keepers. Regarding the Kelsey there was no evidence on record, so far as he knew, that it ever ripened north of Carolina. Mr. Van Deman found that Kelsey, which was said to ripen north of the Carolinas, was not the Kelsey. It would not ripen where figs would not thrive; had winter-killed in Texas. It probably blossoms successively and ripens through a series of three months at the south, rendering it very valuable; a magnificent plum, but not suited to northern localities. Burbank is better than Lombard, and Abundance will average as good. The Willard poor one year and good the next. In Japan they eat stone fruits green, breaking off a bunch of unripe plums and eating them from the branch. The Japan plums are certainly a coming fruit. Satsuma in quality is not high, but is otherwise a good plum.

Hon. J. H. HALE, of Connecticut, considered this one of the most important subjects. He had been watching these Japan plums, and in New England fruitgrowers were satisfied that for profitable market planting the Japan plums held out wonderful promise of profit. In his opinion one of the greatest horticultural openings to-day for profitable orchard planting, lay in Japan plums. His observation had been that they were better shippers than European plums and better keepers, in which respect they had a great advantage. Beautiful in appearance and very good in quality, except the Ogon. The others are from good to very good. He thought Satsuma very good indeed and an excellent keeper; will keep two weeks. They could not do that with European plums. The Japan plums offer a wonderful field for study and for great reward, coming into bearing the second or third year after planting, and the fruit will command the market anywhere.

Mr. JOHN CRAIG, of Ottawa: We have tried all the named varieties of Japan plums, and they have all left us except one, which, I believe, belongs to the family of Simoni. It is the earliest one we have. The tree had stood thirty-two degrees below zero for days together. We are top-working the other trees on our American plums, and I think the Burbank and Abundance will be grown successfully.

Prof. BAILEY thought the variety referred to by the last speaker was a Botan, he having received a sample from Mr. Craig.

*Are there any of the new peaches more hardy than our old sorts?*

Mr. HALE could not say, from his experience of late years, that they were. Hill's Chili is an old one, and exceedingly hardy; in twenty years it had never failed to give him some fruit. The Alexander is exceedingly hardy. Of the newer sorts that he had tested, it was strange that the foreign variety, Elberta, was one of the exceedingly hardy peaches; far more so than Stump, Old Mixon and Mountain Rose, which are among the most hardy of the old standard sorts. Elberta, he was satisfied, in both New England and Illinois, was one of the most hardy, and will rank with Hill's Chili and Alexander. It is less troubled with curled leaf than other varieties. Crosby has never failed to produce a crop; ripens with Old Mixon, after Early Crawford.

A member asked what Mr. HALE thought of Stephen's Rareripec, to which he replied that it was hardy, but the fruit was inferior in appearance. He had never seen any satisfactory crops except about eight years ago on the Hudson river, but in his orchard it mildewed and blotched up.

Mr. NELSON SMITH, Geneva, said that Stephen's Rareripec, in the Seneca lake region, was one of the finest peaches grown; white, with red cheek; one of the hardiest; no mildew. He had grown Elberta for several years, and had quite a crop last year. It was one of the best in New York state.

Mr. WILLARD substantiated what the last speaker said of Stephen's Rareripec: ripens just after Late Crawford; perfects itself finely and sells for the highest prices; hardy in the fruit-bud. Hill's Chili is a very poor peach in appearance, and not good to eat from the hand, but it is the best canning peach that was ever raised in this state. The factories will give more for it than for any other variety. We must discriminate between peaches raised for market for the city fruit stands, and those for the canning factories.

*Is lime beneficial applied to the soil in orchards or nursery rows?*

Mr. WILLARD: There is no plant food in it. It may, perhaps, set free some other agent in the soil, but I don't suppose a man would know anything about it.

Mr. Root thought the soil abundantly supplied with it without applying.

Mr. G. G. ATWOOD: An interesting fact was brought to light in the vicinity of Geneva, where the soil is limestone in character. One of the professors from the

college has been canvassing the section with a small bottle of muriatic acid. He came into the fields to find at what depth lime could be found. We found, particularly in clay, that lime was not present above almost on average of eighteen inches. It was so marked that in the case of a railroad cut, where the land was rolling, the lime was almost uniform at the top and bottom.

*Has anything been done to prevent strawberry rust or blight?*

Mr. TABER: I am not troubled much with rust, and have had no occasion to do other than leave out varieties troubled in that way.

Mr. HOOKER said Bordeaux mixture had been recommended.

Mr. TICE (Oswego): It troubles us directly after planting, the first year. We always plow under the second season.

Mr. FARMER: The best way is to plant on new ground every time. We planted some on ground on which three crops had been raised, and they rusted. It cannot be held wholly in check by Bordeaux mixture.

Mr. TICE: I have a piece that has not had strawberries on for thirty years, and it rusted just as bad as anywhere else.

*Would thorough cultivation and manuring have a tendency to make grapes crack under any condition?*

Mr. SNOW: Why should it cause them to crack?

Pres. BARRY: They do sometimes.

Mr. SNOW: There might be some cause aside from the fruit having a thin skin, such as hard weather striking them when nearly ripe. It is a defect in a variety to have too thin a skin.

*How long should young pears and peach trees be allowed to limb, or how low should the limbs be allowed to branch?*

Mr. WILLARD: My ideas are at variance with some. I do not believe it a wise thing in planting a tree to divest it of every limb and bud. Would take off a few of the lower limbs six or eight inches high, if a peach, and "spur" it, leaving an opportunity for the bud to develop; think that will help the root system. But the second year I believe the tree is greatly benefited by trimming it up three feet high and allowing it to branch out. Our methods of pruning are so diverse that the system has to be varied to meet the views in regard to it. Would treat pears pretty much the same way.

Mr. PIERCE said that trimming at transplanting was a matter in which judgment should be employed. If the ground was very rich and the tree quite thrifty, it would not do to prune very closely, or the result would be some very strong shoots difficult to manage the second year. Some of the large peach growers of Georgia had allowed but three or four buds to grow at planting, and the result was enormous shoots eight feet or more long and necessitated very severe cutting back the second year. Had the growth been distributed through a dozen buds it would doubtless have resulted in a shapely tree the first season.

Mr. HALE: Our system of late years both in our orchards in Georgia and our ten or fifteen thousand trees in Connecticut, is to take quite small trees, medium, or lower grade; cut down to whips eighteen to twenty inches high. They will sprout all the way up, and after getting about an inch in length we rub them all off except three or four buds on different sides; let them grow freely. Formerly, in the second year, we sheared close, but now shorten in but very little, just enough to make a well-balanced head. Then, in after years, we shear off one-half to two-thirds of new growth each season as well as thinning out crowding branches. We can also thin the fruit more economically, and pick better. Am thoroughly in favor of low headed trees.

Mr. HENRY LUTTS: I infer that Mr. Willard wants a tree three or four feet. That is the way we have done; the "spur" system of pruning in my experience is correct. Let the growth come out from the spur, and the following season you have a chance to make a head that you cannot get any other way.

Mr. ATWOOD: I have found we made a mistake in heading standard pears too high: three feet is high enough.

A MEMBER: Is not there some truth that the shading of the bark of a tree will prevent blight?

Pres. BARRY: The natural way for a tree to grow is to branch, but we have to remove some. The fewer you remove the better, I think, for the tree. Trimming things high up is a mistake. Where the side branches are removed the outer bark becomes rough and dry; but with the opposite plan of trimming, it remains smooth and healthy.

Mr. W. H. HART advocated low pruning, and planting the best trees you can get.

The first choice of stock is the best. We want the strongest trees, then head low, and we get a more rapid growth.

MR. PILLOW: With low pruning, trees are less liable to be affected by heavy winds, especially if the winds follow heavy rains.

A MEMBER: In cultivating, what will you do with what is left close to the tree?

MR. HALE: Our southern orchards are all June budded trees. Thirty thousand of them were headed down below eighteen inches, and those made the most vigorous growth I have seen anywhere. They have been only growing two years. We cannot run the cultivator close to them, but as the trees shade the ground the weeds do not grow directly around them.

PROF. BAILEY: In orchards in southwestern Michigan trees are headed low. In June I should advise starting heads rather high except in peach trees; always low in dwarf pears.

MR. LEROY PEASE: Will the fungus work more readily on low branching trees? Also about cultivating. Grass will grow in the shade in the vicinity of Oswego.

MR. HOOKER: We have tried both ways, and finally have settled on the medium height as best. In cultivating dwarf pears we first let them grow low; they became infested with fungus and died out and we got no fruit. Planted twelve feet in the row and twenty feet apart. Our orchard is set and trimmed pretty high, and we can cultivate near them. If allowed to branch too low, you have afterwards to trim up for cultivation. Standard pears should be trimmed about half standard; you can cultivate near enough, and get your tree heads sooner.

*Which is most trying to plant life—long-continued cold, or alternate freezing and thawing?*

MR. WILLARD was called on to answer the question, but said he did not know that he could answer the question. He had observed and found it to be true, and could confirm the statement by a man who has worked for him for twenty years, that when they had a fall of snow before the ground froze they were more apt to have damage on the trees than where the frost cut in three feet deep. The wood winter-kills.

MR. PIERCE: I was in Meehan's nursery last week and saw acres of small stuff mulched. They told me it was tender and they considered the mulch a protection.

*Is it advisable to prune apple trees at the present time if found necessary to cut off large limbs?*

MR. HOOKER: If I had much, would rather wait till spring. Have never seen any serious damage result from moderate pruning at this time of year. We are pruning more or less this winter.

MR. WILLARD: With trees we are going to graft we cut off the top, and then when we want to graft we have clean sailing. Am speaking of fruiting trees.

PRES. BARRY asked Mr. Hooker if he had known of damage to nursery stock by early winter pruning.

MR. HOOKER: Yes; some years ago we had a fine block of two-year old apples on low ground, that were trimmed late in the fall. They froze to the heart and were badly damaged. The varieties were Baldwins and Greenings. Would recommend the pruning of such trees in the spring. It has always been our practice to commence in March.

MR. WILLARD: I think their being on low ground gives the key to the situation.

MR. HART: The damage comes from the drying and checking of the wood, preventing the downward passage of the sap.

*How many persons in New York state grow apricots for profit?*

MR. WILLARD did not know; but he knew of some instances where the effort had been made with tolerable success.

*Has any one noticed leaf blight on the Japanese plum?*

MR. WILLARD: I have never noticed it.

*Is there any mixture that will prevent rot in the plum?*

PROF. BEACH: I do not know.

MR. WAITE did not know. Rot on the peach was caused by the same fungus as on the plum. It was claimed, as a result of some experiments in Delaware, that Bordeaux mixture saved the plum crop from rot, in a favorable season; but he did not consider this conclusive.

MR. WILLARD: Give proper plant food and your will prevent it in a measure.

MR. SLINGERLAND: Pick off the mummy plums before spraying, and pick up the rotten ones as they fall, and burn both.

*I have an orchard of three hundred and fifty Baldwin apple trees thirty years planted. The trees are very strong and thrifty, but have never borne much fruit, not as much as other orchards on the farm of same age. It has been in grass five years, mowed or pastured each season. In fall of 1892, was top-dressed with farm yard manure under the trees as far as the branches extend. Some of it was very coarse. In 1893 had a good growth of wood, but no fruit. The soil under the trees is full of small roots clear up to the surface. Would you advise plowing in spring, say five or six inches deep; cultivate until June 15, and then sow to rape, (to be fed off with lambs in the fall) with an application of three hundred pounds ground bone and one hundred pounds muriate of potash?*

MR. HOOKER: I would think that pretty good treatment. The Baldwin is one of the kinds that has failed of late years. It may be entirely in the season, as Baldwin is more susceptible to climatic influences than other varieties of apples. When we have good dry weather at time of flowering and setting of germ we get excessive crops.

MR. PURDY: Have these trees blossomed in that number of years?

A MEMBER: Yes, in 1892, but they did not bear.

MR. PURDY: Graft the orchard over.

Prof. ROBERTS: If the roots are coming near the surface of the ground, would not it be better to drain the orchard with tile?

MR. HOOKER: If you plow in an apple orchard you will find the soil permeated with living roots. I would plow only three or four inches deep and with a Rochester gang plow.

*Is salt of any value as a fertilizer on fruit trees—would it pay at \$2.50 per ton.*

Dr. CALDWELL could not give any general answer to the question. Salt is not a plant food, but it might release fertility already in the soil.

Prof. ROBERTS: It acts beneficially on light lands, but is a detriment on heavy, clay lands.

*Should the ferro cyanide test, in mixing the Bordeaux mixture, be made as soon as the lime and copper sulphate are mixed, or a few hours later?*

MR. HOOKER: At the time the mixture is made.

MR. WOODWARD: A single drop is enough and it is very sensitive. A drop with a quart will decide it.

*To what extent, and with what success has grape juice, bottled and unfermented, been placed upon the market? Is a license required to sell it?*

MR. SNOW did not think any license is required. He could not say to what extent it was on the market, but it is being manufactured in many places, and quite a good deal is sold. He does not think the proper process for making it has yet been found. The difficulty seems to be in finding suitable packing for it and in keeping it entirely excluded from atmospheric influences.

*From the experience of the last few years what system of training and pruning the grape is proving the best for this state: is the single stake system again coming into use?*

MR. SNOW: The single stake system is not coming into use that I know of. Methods of pruning differ in different sections. Am not prepared to say which is the best. On the Hudson River the Kniffen system is used, and the Brocton system in the Chautauqua region.

*I have an orchard of three hundred dwarf Duchess pear trees on a dark clay loam. Trees are ten years planted and strong, making good growth of wood each year, but never bearing fruit to any amount. Ground cultivated yearly and manured with stable manure. Could these trees be top-worked to Bartlett and Anjou, or other varieties that are more certain to bear, with a good prospect of success? Bartlett standards on the farm bear good crops yearly.*

MR. WILLARD would give them a severe pruning if they had not already been pruned; and if they did not bear then he would graft them. If dwarf pears are pruned annually, cutting back one-half to two-thirds of the season's growth, they will yield.

MR. McCULLOM: If the trees have not fruited would recommend trimming as late as March, and if they do not bear fruit would break off the ends later.

A MEMBER: Where not cut back they continue growing with high cultivation, and did so for three years. Last spring we cut back more thoroughly, not only the large limbs, but especially the small ones that form from the body, thinking I would get a

better balanced tree by having the fruit nearer the body. We pruned any time when we had time and a good, sharp knife.

*What is the best method of grafting old grape vines of worthless varieties?*

Mr. SNOW knew of no method except the cleft method; saw the stock off about two inches below the surface, split and insert the scion, taking care to keep the earth from the cleft. It is simple as grafting a tree. Would do it in the spring about the time the sap starts, or up to the time of the buds opening.

Mr. TABER grafted by digging up a large root and inserting the scion in the end of the root, wrapping it with clay at the junction, burying the cutting or scion so that only one or two buds appeared above ground, and mulch the ground. If the graft grows take the old one out the following spring.

Mr. LUTTS: It does not matter so much how the graft is got in. My best success is where the graft is put below the first year's growth; use pruning knife, giving a chance to put in a larger graft. I don't have to drive it in, but just slip in. A good deal depends on how the graft is cared for; we mound up; we shade with a peach-basket until the graft has started for two inches.

*Is there a remedy for the cherry worm?*

Mr. WILLARD raises a good many cherries, but was never annoyed by any insect inside the fruit. He thought the question had reference to curculio, and if so he would say plant the cherries near plums and they will have no trouble.

Prof. SLINGERLAND: Doubtless it is curculio. Two years ago I advocated spraying for plum curculio, but am not so much of an advocate for it now. I advocate the jarring method.

Prof. GREEN, of the Ohio Experiment Station: We have succeeded in Ohio in keeping curculio insect in check by spraying. We would not go back to jarring, but think the two processes can be combined. We jarred occasionally and destroyed the plums by burning. Where pear orchards are grown near plums it is just as necessary to spray. We sprayed four times for plums, using Paris green in connection with Bordeaux mixture.

A MEMBER: Has any one had experience with spraying for the quince curculio, and the time for doing it?

Mr. GEO. T. POWELL: Using Bordeaux mixture with Paris green we kept quinces entirely free, and the fruit was handsome and bright throughout the season. The explanation of failure with plums is because the spraying is commenced too late. We commenced when fruit was about the size of peas, and repeated about every ten days for three or four times; and had to thin about one-half to three-fourths of the fruit. We have had seventy-five per cent of fruit stung by curculio. It is equally true with the cherry; the spraying must commence early.

Mr. J. J. HARRISON, Painsville, Ohio: I sprayed cherries for three years, and the third year the fruit was perfect. Previously we had always had seventy-five per cent of crop injured by curculio. Subsequently I left the place; my successor did not spray, and two years from the time I left the curculio became very bad, and now the crop is almost entirely destroyed.

*Is Sutton's Beauty a profitable apple to raise for market in western New York?*

Mr. WILLARD: One of the best apples in the world.

*What are the best fertilizers for vineyards?*

Mr. WOODWARD: Ashes and bone-dust.

Mr. TABER: Apply muriate of potash if you do not get wood enough; use potash and bone for fruit. We generally get wood growth enough.

Mr. CAMPBELL: As a rule use ashes and bone-dust; but there might be cases where suitable manure, well-rotted, would be better.

*Will it pay to sow oats in a vineyard or among fruit trees at last plowing for fall protection or winter mulch?*

Mr. SPENCER: It is my custom to sow rye in the fall and plow under in the spring; soil is clay, heavy and underdrained. We plow under about May 15. Clay is more friable, though last August sowed crimson clover, which is now looking very fairly. In addition I put on bone and muriate of potash. If too much yard manure is applied the grapes will shell some and be wanting in flavor. By using potash and bone you get a better flavored fruit.

Mr. WOODWARD: My ideal way of treating a peach orchard is cultivating till the middle of August; then sow to rye and oats, half and half, and it makes a nice crop to

plow under in the spring. I applied potash and never have grown peaches of so high a color and good quality.

*What is best for an orchard of Northern Spy eighteen years old, that has not fruited a barrel of good apples?*

MR. WILLARD: Cut off and graft over to something that will bear.

MR. F. H. PLUMB, Westfield, Mass.: Northern Spy is a sterile variety. Graft it partially with a non-sterile variety.

*What success has attended the top working of weak-growing varieties of pears upon the Keiffer?*

MR. WILLARD: So good that we don't want anything better. MR. POWELL has had the idea that by working the Bartlett on the Keiffer he could retard the ripening of the Bartlett. I told him he was perfectly safe, because if it was a failure he could saw off the graft and still have a good pear.

*Does any one know anything about the Fodder Plant?*

MR. H. FROST said it was "Polygonum Sachalinense;" described in a French catalogue as "a perennial plant, growing to a height of twelve feet, with heart-shaped leaves which come to sixteen inches in length and twelve inches broad; color dark green, largely maculated in places by dark purple; bears white flowers in groups. One of the finest ornamental plants." The *Garden and Forest* speaks of its introduction into Russia some years since as an ornamental plant. It is a vigorous grower, has large leaves and is rather a handsome plant with leaf stalks of cardinal red. Its inconspicuous flowers produce a good deal of nectar and are much frequented by bees. This Polygonum has especial interest just now as a forage plant, since it has been recommended in several European journals for that purpose. It is said that the young plant quickly pushes up fresh shoots in all directions and will soon occupy an area a yard square. These shoots when young are edible, and when blanched can be used as asparagus, though not of as high quality. When they have grown from three to four feet these shoots can be cut and fed to cattle, which seem to relish them very much. It is propagated by division of rhizomes, and if set out a yard apart the surface of the soil will be covered in a year or two with abundance of forage from which three or four crops can be taken every season. Its yield of green fodder is said to range from thirty to fifty tons per acre, and it might prove a valuable crop for ensilage. It produces six or more crops (or cuttings) per season after the first year. When not cut, the plant attains a height of six to ten feet with alternate cordate leaves eight to sixteen inches long, and six to eleven inches wide. It should be cut twice during the first season whenever it reaches a height of three feet. After that it should be permitted to go to seed. It will remain green and leafy until frost and withstands drought very well. The annual amount of green fodder produced is very large. The agricultural department of the United States has written to France, asking the price of several hundred sections of roots for distribution among the different agricultural stations throughout the country.

A MEMBER: Can it be excavated?

MR. FROST: It will be hard to get rid of.

*What is the Columbian raspberry?*

MR. FARMER: The *Rural New Yorker* says it is the same as, or no better than Shaffer's.

MR. TABER: They say it does not differ very much from Shaffer's, yet that it is a little lighter in color and of a little better flavor. After seeing the fruit here last year I procured a half dozen plants from the originator. They were good ones; started into growth quickly and one went over eight feet in length. I set them in a grape-row from which the grapes had been taken out, and tied them to the wires. I laid them on the ground to root for tips. So far, I am pleased with their growth, and hope they will be better than the Shaffer. The juice is lovely, in my opinion.

MR. FARMER: The *Rural New Yorker*, speaking of the Columbian and the Shaffer, says if you have one you do not need the other, so I don't think it is worth while to pay out big money for the Columbian.

PRES. BARRY: I went to see it last summer when covered with fruit. It is a strong grower; a great yielder; and of the Shaffer type. The impression I gained was that it was better than Shaffer, but I should want to see the two grown together to form a correct idea of their value. Shaffer's has a peculiar color, and I don't know whether this variety would be an improvement over that or not. It is lighter in color than the

Shaffer. I could not say whether it would be a good shipper; its particular value is for canning.

Mr. TICE: Would not there be more vigor in the plant now than a few years hence?

Mr. WILLARD: It has shown that same vigor for three or four years. I first saw it at Oswego.

Mr. FARMER: I don't want it to go out that I condemn the Columbian; but we really need a good red raspberry. I swear by the *Rural*, and they say it isn't any better than the Shaffer. The Burt strawberry was considered a new variety for many years, and it eventually proved to be nothing but Captain Jack. The reason it was better than that variety was because it received better culture. It may be the same with the Columbian. Shaffer's is a wonderful berry, and the best we have.

Mr. Z. H. HARRIS: I visited the Geneva Experiment Station three or four times the past season, and saw Shaffer's and Columbian side by side. I think the latter has most decided advantages over the former, particularly in color; and it is in every respect more pleasing.

### THE BUD MOTH AND THE PEAR PSYLLA.

Mr. M. V. SLINGERLAND, of Cornell Experiment Station, was invited to make some remarks regarding this pest, and he said: This insect pest seems to be alarmingly on the increase in the orchards of western New York. It appears on the opening buds of apple, pear, peach, cherry, plum and quince trees, early in the spring, as a small brown caterpillar. The opening leaves are tied together with silken threads and the caterpillar feeds on the leaves or flowers within this nest thus formed. About June 15 the caterpillars are about three-quarters of an inch long, and are ready to change to pupæ, which they do in a silk lined case in their nest. The little moth, which looks very much like a codlin moth, emerges in about two weeks, and curious, scale-like eggs are soon laid on the leaves. The minute brown worms hatching from the eggs feed during the remainder of the summer on the surface of the leaves, but protected by a silken covering. Just before the leaves fall in autumn the caterpillars, then half grown, migrate from the leaves to the angular places in the bark of the twigs, usually within a few inches of the terminal buds. Here they spin over themselves a little silken covering, within which they pass the winter, and from which they emerge in the spring to "nip in the bud" a prospective crop of fruit, a graft, or a budded stock. The pest is a very difficult one to fight. It cannot be successfully combated in the egg or moth stages. The only time when we can hope to reduce its numbers is in the spring after it leaves its winter retreat. A thorough spraying with Paris green when the buds are opening, and again a week later, will, I believe, destroy a large percentage of the caterpillars. On young, small trees the nests, which are quite conspicuous about June 1, may be picked off and burned with profit, thus preventing the increase of the pest for the next season. Another practicable method by which the caterpillars may be destroyed before they have done much damage is to burn all the prunings from the infested trees. The pruning should be done, of course, some time in the winter, or before April 1, in the spring. If these suggestions are intelligently followed out I believe this fearful pest can be kept in check. The bud moth is discussed in detail in bulletin No. 50 of the Cornell Experiment Station.

The pear psylla is present in a majority of the pear orchards of our state, and, under favorable conditions, is capable of causing whole crops of fruit and most of the leaves to fall from the trees in mid-summer, and in many cases the death of the trees has followed. It is thus one of the worst pests that pear growers have to fear. The pest appears on the trees during the first warm days of spring, before the buds start, in the form of an active, jumping flea, scarcely as large as a wheat kernel, and resembling a *Cicada* in miniature. These forms, the adults, have come from the crevices of the bark, where they spent the winter, to lay their very minute yellow eggs in the wrinkles on the bark just below the terminal buds. From these eggs there hatch, about the time the leaves are expanding, minute, flat, oval, yellow lice, which move quite slowly into the axils of the leaves and flowers, where they begin at once to suck up the sap from the tree. Thousands of them often occur on a small twig, and so many little pumps at work soon cause the new leaves and shoots to droop or turn yellow and look sickly. These appearances are about the first signs that tell the pear grower the pear psylla is at work.

The insect is so small that it is overlooked unless especial pains be taken. (Every fruit-grower should have a small pocket magnifier or lense, and make frequent use of it on his trees.) The nymphs which hatch from the eggs become full grown—(it would take twenty of them to measure an inch)—in about a month, and change to the adult jumping forms, which lay eggs on the leaves for another brood. There are four or five broods during the summer, all working in the same manner mostly in the axis of the leaves and fruit stems. A very curious and characteristic feature of an attack of this pest is the immense quantities of a sweet, sticky fluid called honey dew, which is secreted by the nymphs, and which covers the leaves, fruit and branches of the tree, or even drops off onto the vegetation beneath. Within this honey dew there grows a black fungus which causes the tree, especially after the leaves have fallen, to look as though it had been thinly painted with black, or as though soot had been sifted on it. Most of the damage is done before June 15, by which time the fruit and many leaves are so much weakened that they almost cease to grow and soon drop off. The pest prefers the Bartlett, but works extensively on most of the other varieties. A long series of experiments showed that we cannot kill the pest in the egg without injuring the tree also. As the pest obtains its food by sucking and not by chewing, the arsenites or other poisons will have no effect upon it. In kerosene emulsion, however, we have a very effective agent for the destruction of this serious pest. To make emulsion, thoroughly dissolve one-half pound hard or soft soap in one gallon boiling water. While this solution is still very hot add two gallons of kerosene and quickly begin to agitate the whole mass through a syringe or force pump, drawing the liquid into the pump and forcing it back into the dish. Continue this for five minutes or until the whole mass assumes a creamy color and consistency will adhere to the sides of the vessel, and not glide off like oil. It may now be readily diluted with cold rain water, or the whole mass may be allowed to cool when it has a semi-solid form, not unlike lopered milk. This standard emulsion if covered and placed in a cool dark place will keep for a long time. In making a dilution from this cold emulsion, it is necessary to dissolve the amount required in three or four parts of boiling water, after which cold rain water may be added in the required quantities. I found that by spraying trees once, just after the leaves had expanded in the spring, with this emulsion diluted with fifteen parts of water that I killed from seventy-five to ninety per cent of the nymphs. This emulsion must come in contact with the insect, and thus the spraying should be very thorough; but the nymphs die within a few seconds after being hit so that a rain storm soon after spraying does no harm. It is better to make the application just after a rain, when the leaves have dried off, for the rain will wash off much of the honey dew which often so covers the nymphs as to render it impossible to hit them with the emulsion. A second application a few days later will doubtless be advisable in a serious attack by the pest. Do not wait until after June 1st to do the spraying, for most of the damage is done by the first spring brood of nymphs. It has been found impracticable to spray the adults as they are too active, flying away from the tree in clouds when the spray strikes it, and they are also not so susceptible to the emulsion. In some orchards the birds seem to have picked a good many of the hibernating adults out from the crevices of the bark. So far as now known the pest has no other natural enemies. Watch your trees in the spring, and spray before June 1st with the emulsion, and if it is thoroughly done this pest can be kept within bounds. For full discussion of this pest refer to bulletin 44 of the Cornell Experiment Station.

Mr. WILLARD asked what effect the pear psylla had on the fruit?

Mr. SLINGERLAND: So far as I know there are no external visible indications of the work of the insect on the fruit itself. Of course the fruit is stunted in its growth from the loss of sap taken from its stem by the nymphs; and finally the fruits are so weakened that they drop off when about half grown in mid-summer. Often the honey dew runs down on to the fruit and renders it somewhat unsightly. The pest has no jaws by which it could mar the fruit in any manner, as does the plum curculio or codlin moth.

Mr. PEASE, of Oswego: Can you mix the arsenites and Bordeaux mixture with the emulsion?

Mr. SLINGERLAND: Yes; Paris green, Bordeaux mixture, and kerosene emulsion can be mixed together, and the mixture would then contain all the elements to make it almost a panacea for all the insect and fungous ills of the fruit grower. But unfortunately the combination is not easily secured; the Bordeaux must be in a neutral condition or the emulsion will not mix with it satisfactory; and some other minor factors enter in so that one cannot depend on getting a good staple mixture although all the conditions are fulfilled. Again, when the combination, or Cornell mixture as it was dubbed, was applied to trees, it was found that the liquid did not spread over the

surface of the leaves and branches as well as would either ingredient alone; it seemed to gather in small drops on the tree. Therefore, for the reasons that the combination is hard to make and cannot be so effectively applied as could be either ingredient alone, I cannot recommend the Cornell mixture to fruitgrowers. There are also, on the whole, but few instances where we need to spray for the sucking insects at the same time as for the chewing insects and fungi. The kerosene emulsion also cannot be mixed with the arsenites alone.

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### SPOTTING OF QUINCES.

Mr. WILLARD said Mr. Hopkins had spoken to him in reference to his large planting of Orange quinces beginning to spot. The speaker said Mr. Maxwell came to look over a few quinces he had, and finding them clean, and free from fungi, asked how he cared for them. His reply was that he gave them no care; he cut off about one-half the previous year's growth, and the only thing furnished in the way of plant food was wood ashes. Some years before, when Mr. Willard gave them rich, barn-yard manure they did spot; but they stopped it, and he believed that was the trouble with others. Mr. Hopkins told him his plan of cultivation. Mr. Willard does not plow deep, but uses the Rochester gang plow, and cultivates entirely with the spring-tooth harrow. Mr. Hopkins had some quinces that were not disturbed during the summer, and they have not been inclined to spot. The proper plant food had more to do with this disease than anything else. Mr. Willard believed fruitgrowers had been using too much nitrogenous substances and too little potash; and they would have to do less spraying.

Mr. WOODARD had a little tool made specially for him to cultivate his orchards of peaches, quinces, etc. It was a cut way harrow. Instead of putting the sections close together, he had it made so he could work the heads and arrange it so he could cultivate close to trees. He had three of these tools, and would not sell them for a hundred dollars apiece if he could not procure others of the same make.

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Allis, Miss Mary C.	Adrian	Lenawee.
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\* NOTE.—A Life Membership is \$10. The fund thus gathered is invested in good securities and only the interest employed for general purposes.

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Foster, Mrs. Mary E.	Ann Arbor	Washtenaw.
Fowler, S. W.	Manistee	Manistee.
Fuller, S. L.	Grand Rapids	Kent.
Fuller, S. R.	Eaton Rapids	Eaton.
Garfield, Chas. W.	Grand Rapids	Kent.
Geddes, David	Saginaw	Saginaw.
Gibson, Mrs. W. K.	Jackson	Jackson.
Gilbert, John (deceased)	Ovid	Clinton.
Graham, Elwood	Grand Rapids	Kent.
Greening, J. C.	Monroe	Monroe.
Griggs, George W. (deceased)	Grand Rapids	Kent.
Guild, E. F.	East Saginaw	Saginaw.
Hall, Frederick (deceased)	Ionia	Ionia.
Hanford, H. P. (deceased)	Bristol	Indiana.
Hannah, Perry	Traverse City	Grand Traverse.
Hathaway, B.	Little Prairie Ronde	Cass.
Haviland, J. B. (deceased)	Traverse City	Grand Traverse.
Hayden, Mrs. H. A.	Jackson	Jackson.
Humphrey, J. W.	South Haven	Van Buren.
Husted, James D.	Vineyard	Georgia.
Husted, Noah P.	Lowell	Kent.
Ilgenfritz, I. E.	Monroe	Monroe.
Ilgenfritz, C. A.	Monroe	Monroe.
Ives, Caleb	Monroe	Monroe.
Jerome, Mrs. David H.	Saginaw City	Saginaw.
Johnson, William	Vassar	Tuscola.
Kedzie, R. C.	Lansing	Ingham.
Kelsey, E. P.	Ionia	Ionia.
Kidd, J. H.	Ionia	Ionia.
Klein, F. J., 156 St. Aubin ave.	Detroit	Wayne.
Knapp, S. O. (deceased)	Jackson	Jackson.
Knapp, E. U.	Grand Rapids	Kent.
Kniseley, A. J.	Benton Harbor	Berrien.
Lawton, George W. (deceased)	Lawton	Van Buren.
Lincoln, L. C.	Greenville	Montcalm.
Lincoln, Mrs. L. C.	Greenville	Montcalm.
Linderman, Harvey J. (deceased)	South Haven	Van Buren.
Linderman, A. T.	Whitehall	Muskegon.
Littlejohn, F. J. (deceased)	Allegan	Allegan.
Loomis, P. B.	Jackson	Jackson.
Lyon, T. T.	South Haven	Van Buren.
Mann, S. B.	Glenwood	Florida.
Marshall, William A.	Old Mission	Grand Traverse.

Name.	P. O. Address.	County.
Mason, L. M.	East Saginaw	Saginaw.
Mason, Mrs. Sarah A.	East Saginaw	Saginaw.
McCallam, E. H.	Lansing	Ingham.
McClatchie, G. C.	Ludington	Mason.
McDiarmid, James D.	Bear Lake	Manistee.
McNaughton, Robert T.	Jackson	Jackson.
Mitchell, W. H. C.	Traverse City	Grand Traverse.
Moore, J. H.	Lansing	Ingham.
Monroe, C. J.	South Haven	Van Buren.
Monroe, Judge (deceased)	Lawrence	Van Buren.
Montague, A. K.	Traverse City	Grand Traverse.
Nabors, Nellie S.	Flint	Genesee.
Nichols, W. W.	Ann Arbor	Washtenaw.
Noble, W. A.	Monroe	Monroe.
Odell, Samuel W.	Muskegon	Muskegon.
Palmer, Thomas W.	Detroit	Wayne.
Parmelee, George (deceased)	Old Mission	Grand Traverse.
Parmelee, Mrs. George (deceased)	Old Mission	Grand Traverse.
Parke, Mrs. Amos S.	East Saginaw	Saginaw.
Parsons, Philo	Detroit	Wayne.
Partridge, B. F.	Bay City	Bay.
Pearsall, S. M.	Grand Rapids	Kent.
Perry, George L.	Lansing	Ingham.
Petty, Thomas	Spring Lake	Ottawa.
Pierce, N. B.	Ludington	Mason.
Potter, E. M.	Manderson	Nebraska.
Ramsdell, J. G.	Traverse City	Grand Traverse.
Ramsdell, Mrs. J. G.	Traverse City	Grand Traverse.
Ransom, W. D.	St. Joseph	Berrien.
Renwick, T. R.	Grand Rapids	Kent.
Reynolds, E. H.	Monroe	Monroe.
Reynolds, H. G.	Agricultural College	Ingham.
Rich, Hampton	Ionia	Ionia.
Root, Amos	Jackson	Jackson.
Rose, D. Forsyth	East Saginaw	Saginaw.
Rose, Mrs. Sophie E.	East Saginaw	Saginaw.
Rowe, William	Grand Rapids	Kent.
Rowe, William N.	Grand Rapids	Kent.
Russell, Dr. Geo. B.	Detroit	Wayne.
Rust, C. E.	Ionia	Ionia.
Satterlee, James	Albany	New York.
Savidge, Hunter (deceased)	Spring Lake	Ottawa.
Scott, J. Austin (deceased)	Ann Arbor	Washtenaw.
Scott, Dr. Austin	Newark	New Jersey.
Scott, E. H.	Ann Arbor	Washtenaw.
Sessions, Charles A.	Mears	Oceana.
Sessions, Alonzo (deceased)	Ionia	Ionia.
Sessions, William	Ionia	Ionia.
Shirts, E. J.	Shelby	Oceana.
Shoop, Rev. D. R.	Hastings	Barry.
Sinclair, W. G.	Grand Rapids	Kent.
Sigler, Artimus	Adrian	Lenawee.
Slayton, Asa W.	Grand Rapids	Kent.
Sleeper, F. S. (deceased)	Galesburg	Kalamazoo.
Smith, E. T.	Ionia	Ionia.
Smith, N. E.	Ionia	Ionia.
Smith, H. H.	Jackson	Jackson.
Soule, J. B.	Fruitport	Muskegon.
Staunton, G. W.	Grand Rapids	Kent.
Stearns, J. N.	Kalamazoo	Kalamazoo.
Stearns, Ida L.	Kalamazoo	Kalamazoo.

Name.	P. O. Address.	County.
Steere, B. W. ....	Adrian .....	Lenawee.
Sterling, F. S. ....	Monroe .....	Monroe.
Sterling, J. M. ....	Monroe .....	Monroe.
Sterling, J. C. (deceased) .....	Monroe .....	Monroe.
Sterling, W. C. ....	Monroe .....	Monroe.
Sterling, W. P. ....	Monroe .....	Monroe.
Sterling, Mrs. Emma M. ....	Monroe .....	Monroe.
Stockbridge, F. B. ....	Kalamazoo .....	Kalamazoo.
Suttle, John (deceased) .....	Grand Rapids .....	Kent.
Taylor, George .....	Kalamazoo .....	Kalamazoo.
Taylor, George C. ....	Kalamazoo .....	Kalamazoo.
Thomas, H. F. ....	Jackson .....	Jackson.
Thompson, W. D. ....	Jackson .....	Jackson.
Thompson, J. P. (deceased) .....	Detroit .....	Wayne.
Towles, George W. (deceased) .....	Benton Harbor .....	Berrien.
Tracy, Will W. ....	Detroit .....	Wayne.
Vick, James (deceased) .....	Rochester .....	New York.
Vick, James, jr. ....	Rochester .....	New York.
Vick, Frank H. ....	Rochester .....	New York.
Vick, Charles H. ....	Rochester .....	New York.
Vick, E. Colston .....	Rochester .....	New York.
Wadsworth, W. R. ....	Lapeer .....	Lapeer.
Waite, Gilbert M. ....	Paw Paw .....	Van Buren.
Walker, S. S. ....	St. Johns .....	Clinton.
Watkins, L. D. ....	Manchester .....	Washtenaw.
Webber, William L. ....	East Saginaw .....	Saginaw.
Webber, George W. ....	Ionia .....	Ionia.
Webber, Miss Frances E. ....	East Saginaw .....	Saginaw.
Wells, H. G. (deceased) .....	Kalamazoo .....	Kalamazoo.
Whittlessey, John .....	St. Joseph .....	Berrien.
Wier, Antoine .....	Monroe .....	Monroe.
Wilde, Thomas .....	Herrington .....	Ottawa.
Williams, S. P. ....	Monroe .....	Monroe.
Winchester, A. O. ....	St. Joseph .....	Berrien.
Wooding, Charles F. ....	Lowell .....	Kent.
Woodward, David .....	Clinton .....	Lenawee.
Wurtz, Elias H. ....	East Saginaw .....	Saginaw.
Zeigler, J. C. ....	Saginaw City .....	Saginaw.

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